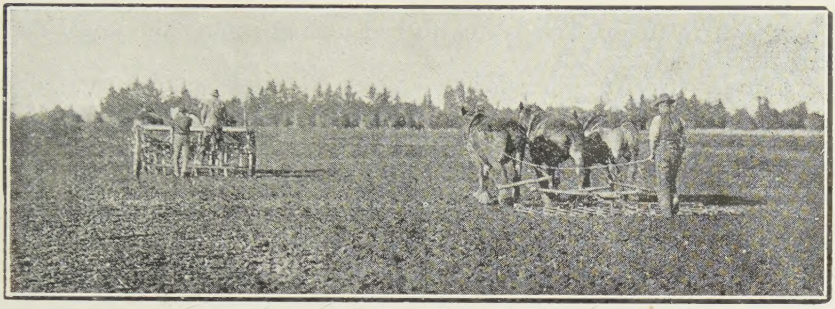

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BUTTER-BOXES AND THEIR DESIGN.

PROPOSED METAL-BOUND WASTE-ELIMINATING TYPES.

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1. INTRODUCTION.

THIS report presents the results of an investigation made by the State Forest Service, at the request of the Department of Agriculture, into the design and construction of butter-boxes suitable for the export butter trade. Design of these packages has been based upon recognized and proven principles of box-construction. Laboratory and service tests, however, form the only final and conclusive method of attacking the problem, and for this work a set of box-testing equipment is now being installed at the Auckland testing-station of the Forest Service. The results of these tests will form the subject of a special report.

Probably as much as 90 per cent. of the butter produced in New Zealand is shipped in white-pine boxes, the remaining 10 per cent. being carried in silver-beech and imported boxes. The virgin white-pine forests have been seriously depleted during the last twenty years, so much so that if a normal increase in consumption continues not more than fifteen years' supply remains. Even now manufacturers report difficulties in maintaining their supplies.

Complaints regarding excessive breakage of boxes have been received from time to time. This is due to bad nailing and to the unbalanced construction of the box.

Tentative specifications for two types of metal-bound butter-boxes are published in this report for trial and criticism. Both types are claimed to provide a stronger and cheaper package, and to consume 30 to 40 per cent. less timber than the existing standard export butter-box. Either sawn or veneered timber may be used. The nailless strap type (Fig. 1, page 147) is substantially the same as the existing type, except that thinner timber is used. The package is bound at the butter-factory with two flat metal straps, and box-factories will be able to change over to the manufacture of this type without any alteration to their equipment. The wire-bound veneer type uses still thinner timber than the nailless strap type, but requires special machinery for its manufacture. The box is cleated at the ends, and therefore takes up approximately 5 per cent. more shipping-space than the nailless strap type. It may, however, be sent from the box-manufacturer to the butter-factory in a folder-out condition (Fig. 2, page 151), thus offsetting to a slight extent any extra shipping-charges in the made-up form. The dairy industry of Victoria has used a similar type of box for some years, but has received many complaints regarding the rusting of staples on the inner surfaces of the box and the consequent staining of wrapping-paper and butter. This staining must be eliminated if the wire-bound veneer box is to be adopted for the New Zealand export trade; practical means of overcoming this trouble are now being investigated by the Forest Service.

Until the Victorian wire-bound box has been demonstrated in this country it is undesirable that the package be adopted for general use. Practically the same economy can be effected by the use of the metal-strapped box, without any expenditure on manufacturing equipment.

OBJECT AND SCOPE OF INVESTIGATION.

It is the main purpose of this investigation to provide a box which will render the greatest amount of serviceability for the smallest consumption of timber at the least possible cost of manufacture. The investigation is confined solely to the study of the mechanical and physical features of butter-box construction. Lack of mention of such factors as the use of substitute timbers and of shellacking and paraffining is due not to their unimportance, but to the fact that they are considered outside the scope of the present work. They will form the subject of a special report to be rendered at a later date.

The material for this study has been collected from reports issued by the Governments of butter-exporting countries, and by consultation with box-manufacturers, buttermakers, shipping agents, and officials of the Department of Agriculture.

The principles of box-construction have been established by the Madison Forest Products Laboratory of the United States Forest Service, and widely adopted by box-manufacturers and shippers throughout Canada and the United States. The use of metal straps was investigated by testing over two thousand nailed wooden boxes of various sizes and shapes, loaded with different contents varying in weight from 60 lb. to 800 lb., and bound with flat metal straps. Such investigations have been used as a basis for the present report.

GENERAL CONSIDERATIONS.

Essential features in a first-class butter-box are (1) good protection to the contents, (2) clean and attractive appearance, (3) ease of opening for inspection and grading, (4) balanced and economical construction, and (5) cheapness.

It is the primary purpose of a box to deliver its contents in the same condition as when first packed. The butter must reach its destination unstained, untainted, and dustless. The box should remain unbroken in any way. In a recent shipment of butter to London 14 per cent. of the boxes were reported to be broken. In a similar manner the Canadian market was unfavourably prejudiced last season by the delivery of a large number of broken packages. Preferably the box should be so constructed that any illegal opening for the substitution of inferior produce is easily detected.

The New Zealand box has for some considerable time been recognized by all dairying countries as one of the most attractive containers placed on the world's markets. Australia, Canada, America, France, Holland, Denmark, and Russia all pay tribute to the superiority of the New Zealand package. The English retailer favours it above all others for use in general delivery of goods from his store. Other things being equal, that butter which is contained in the finest package will sell the best, and the clean and attractive appearance of the New Zealand box has played a decided part in the development of the Dominion's export butter trade. With increasing supplies of foreign butters appearing on the English market it now becomes necessary as never before to maintain and increase the superiority of New Zealand's produce, not only by improving the quality of the products, but also by marketing them in as attractive a fashion as possible. This principle has been maintained as a primary consideration in the present study.

Approximately 5 per cent. of the boxes must be opened for grading purposes before shipment from New Zealand, and the ideal package should allow of easy opening for inspection and grading. With the grain of the ends and sides running parallel to the top and bottom surfaces, the knocking-off of tops often causes the box to fail by splitting of the ends and sides. The Forest Service is seeking to develop a box-opener which will eliminate these failures.

When all the elements in the construction of a box resist equally the destructive hazards of service the box is balanced in construction. A balanced box may yet be too strong, or excessively heavy, or even too weak, and the chief problem in box-design is to so detail the parts that balanced construction and proper strength are both obtained at a minimum cost. The failure of many New Zealand butter-boxes in spite of comparatively thick timber employed is an indication that the present design is lacking in these features.

2. THE NAILLESS METAL STRAPPED BOX.

Metal strappings applied to boxes improve the rigidity of the package, distribute shocks which otherwise are locally absorbed, and enable thinner timber to be used, thus making a safer and more economical container.

Metal strappings ordinarily encircle the small dimensions of the box, and act perpendicular to the grain in the sides, top, and bottom. Two types are in common use—nailed and nailless. The former is usually applied by nailing through flat metal straps at the extreme ends of the package; the latter relies upon the initial tension given to it when the ends are mechanically joined to keep it in position, ordinarily some distance from the ends of the box. Although the nailed type gives a slightly more rigid package, and offers some reinforcement to the box even after breakage of the strapping, the nailless type offers many advantages: (1.) It is cheap and easily to apply—approximately 1½d. per box. (2.) Removal and replacement at grading-stores is cheap and easy—approximately $\frac{1}{10}$d. per box. (3.) By use of a specially marked seal the illegal opening and closing of any package can be quickly detected. No substitution of inferior butter is possible. (4.) It does not detract from the appearance of the box.

ACTION OF METAL STRAPPING.

All metal strappings are of considerable value for holding the box-parts in place, even after some of the boards have pulled entirely loose at the joints. Nailless strappings applied some distance from the ends of the box help to distribute to the various parts of the box the shocks which are otherwise locally absorbed. This action relieves much of the direct pull on the nails in the ends, and also reduces materially the failures due to the sides, top, and bottom splitting or breaking across the grain.

The commonest failure in the existing box is the splitting of ends, which often allows the box to come in two. This tendency may be reduced by binding with two straps applied one-sixth of the length of the box from the ends.

The strapping must be drawn sufficiently tight to cut in the corners or edges of the box and to spring the sides, and should be maintained under considerable tension until the box has served the desired purpose. Strappings must be applied at right angles to the box, otherwise they will adjust themselves during transit and become quite loose. They should not be applied until immediately before the box is ready for shipment.

METAL STRAPS AND WIRES.

Both metal straps and wires are made in various sizes of both annealed and unannealed metal. Annealed metal has a much lower maximum tensile strength than unannealed strapping, stretches considerably more before failure or under a green load, has less holding-power at the seals ordinarily used to fasten the ends of the nailless strapping, and is more easily penetrated by nails.

Nailless strapping should be sufficiently hard to hold the seals effectively, and at the same time be sufficiently soft to permit ready application of the seals, and also to yield slightly and absorb shocks. Investigations have shown that strapping having a maximum tensile strength of approximately 84,000 lb. per square inch gives very satisfactory results. The seals used to hold the ends of nailless strapping should develop at least 75 per cent. of the strength of the strapping.

Where two flat metal straps are used as already recommended their total cross-sectional area in square inches may be calculated from the formula

$$\frac{\sqrt{2W}}{840}$$

where W = gross weight of box and contents
= approximate 65 lb.

The solution of this equation gives the nearest flat metal strap available as $\frac{3}{8}$ in. wide by 0·018 in. thick.

New Zealand State Forest Service tests show that the "Acme" flat metal strapping conforms to these specifications. Information is not yet available to allow any decision to be reached regarding the use of annealed wire bindings with a maximum tensile stress varying from 56,000 lb. to 76,000 lb. per square inch. The machines used for applying most types of nailless binding are very inexpensive, and in some cases are loaned free of charge when bindings are purchased from the owners of machines.

NAILING.

Metal bindings, however, do not assure in themselves a serviceable container. Nailing or other fastening at the joints is one of the most important factors in the construction of all boxes. Consequently the use of dense species such as silver-beech, &c., for ends, and the observance of other factors influencing the holding-power of nails, are of the utmost importance in both strapped and unstrapped boxes. Without sufficient nails or other fastenings at the joints the box lacks rigidity, and the straps hold the box-parts together merely as a bundle. A properly constructed unstrapped box, fastened with the right number of nails of the proper size and correctly spaced, is often stronger and gives better results than a box constructed with material of the same thickness and bound with metal straps but improperly nailed.

Cement-coated nails are used almost universally by box-manufacturers in Canada and the United States, as they have a much higher resistance to withdrawal than plain uncoated nails. The cement coating of the nail consists of various resinous gums mixed by a secret formula, and put on the nails by a baking process. Though the makers do not claim that the nails are absolutely rust-proof, they do claim that nails thus treated will resist the effects of moisture from 20 to 50 per cent. better than the uncoated wire nail. But it is when in use that the non-rusting quality is most evident. There is more coating on the nails than is actually necessary for holding-power. The heat caused by the friction in driving the nail softens the coating, and the surplus is forced towards the head, completely closing any opening: this prevents the admission of moisture between the wood and the nail. Under similar conditions of use the life of a cement-coated nail will be about twice as long as that of an uncoated one. They are claimed to require less force to drive, as the softened coating forms a lubricant. Any slight difficulties attached to their handling in the box-factory do not outweigh the advantages gained, and it is very desirable that the cement-coated nail should be adopted for boxing-work throughout New Zealand. Whereas a 2 in. cement-coated nail driven $1\frac{5}{8}$ in. into the side grain of a piece of American

pine required a force of 226 lb. to withdraw it, a common nail under the same conditions was withdrawn with a force of only 106 lb.

According to recognized practice, the existing ½ in. white-pine box should be fastened with 1¾ in. cement-coated nails, by seven nails per end edge at the sides, six nails per end edge at the top and bottom, and two nails per side edge at the top and bottom. Where common nails are used an extra nail should be placed in each nailing-edge.

The proposed standard metal-strapped box will be fastened with 1½ in. cement-coated nails, by seven nails per end edge at the sides, and by six nails per end edge at the top and bottom. The top and bottom boards are not the full width of the box, so that in applying the metal straps the sides are sprung inwards, thus tending to keep the straps in tension. Spacing-nails at the sides are therefore omitted. The overdriving of nails constitutes a serious source of weakness in boxes, and should be carefully guarded against. Nails should be driven until the top of the head is just flush with the surface of the material. Overdriving nails ⅛ in., which is a common practice, probably reduces the strength of the box by at least 20 per cent.

As illustrative of the relation of the number of nails to amount of rough handling required to cause loss of contents, a number of boxes for two dozen No. 3 cans were tested by the Madison Forest Products Laboratory. The results showed that if a box with seven nails per edge was taken as a base (*i.e.*, 100 per cent.), then one with five nails was only 22 per cent. as strong, one with six nails only 75 per cent. as strong, but one with eight nails per edge was 45 per cent. stronger.

SAVING OF TIMBER.

As a result of the Madison tests already referred to, it has been established that the thickness of the sides, tops, and bottoms of well-balanced wooden boxes, possessing adequate strength and serviceability without metal strappings, may be reduced 20 to 40 per cent. when metal strappings are properly used, without any reduction in the strength and serviceability of the container.

The existing New Zealand butter-box may have the sides, top, and bottom reduced from ½ in. thickness to ⅜ in. thickness if one metal strap across the middle of the box is used, or to 5/16 in. if two or more straps are employed. These reductions represent a saving in timber of approximately 30 per cent. and 18 per cent. respectively. Tests are required to show if still thinner material may be employed, especially in the case of beech, and if the same reductions in thickness are applicable where wire bindings are used. The weakest part of the box is the end, and, although ½ in. material is permitted in the existing box, tests may indicate the advisability of increasing the thickness or of completely redesigning the end.

QUALITY AND FINISH OF TIMBER.

Either sawn or veneered material may be used, but, unless the box is constructed of dry timber, shrinkage is likely to occur and to reduce the circumference of the box to such an extent that the binding becomes quite loose—sometimes loose enough to permit it to

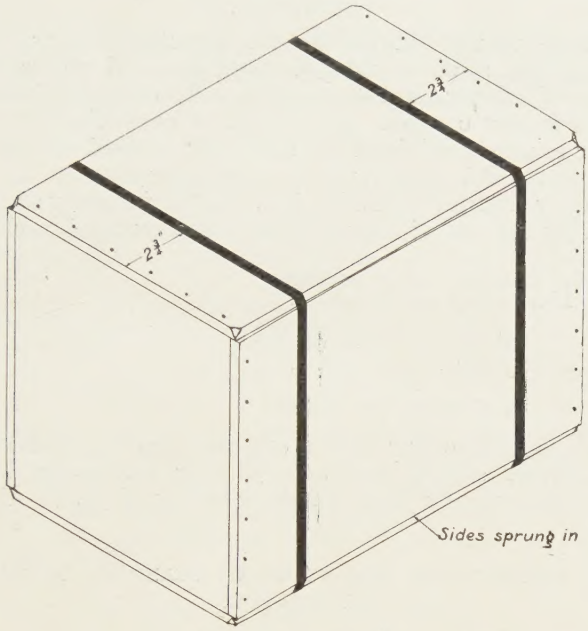


FIG. 1. PROPOSED STANDARD METAL-STRAPPED BUTTER-BOX.

slip off the end of the box. This looseness increases the tendency of the strapping to catch and tear when the box is slid down chutes or dragged across projecting objects, which constitute the most dangerous hazards to which the metal-bound butter-box is likely to be subjected.

The moisture content and change of moisture content in timber used in construction of the box also materially influence the failure of strappings. Timber which is abnormally wet or abnormally dry does not hold the nails so firmly as timber which is properly dried. The shrinkage and swelling of the timber cause a further loosening of the nails, and frequently cause the sides, top, and bottom to split and pull from the nails. The splitting of the boards and loosening of the nails permit greater stresses on the bindings, and thus increase the likelihood of strap failures. Timber should be used having a moisture content varying from 10 to 14 per cent., based on the oven-dry weight of the wood. Samples of wood taken from butter-boxes going into use have been found to contain 30 per cent. of moisture, based on the oven-dry weight of the wood.

The loss in strength of a box due to the use of improperly dried timber and to overdriving of nails may amount to more than 90 per cent. Such facts explain why a New Zealand visitor to Vancouver last year saw blocks of our butter being carried off the wharf on the bottom boards of the boxes—"all that was left of them."

Under the proposed specification fine band-sawn or veneered material will be allowed for sides, top, and bottom. This will make the box approximately ½d. to 1d. cheaper than if planed. The ends should be smooth-planed as formerly.

ECONOMICS.

In addition to the indirect benefits attachable to the use of the metal strappings, such as reduced breakages and protection against substitution of inferior produce, there is a direct saving both in initial cost and in freight charges. As a basis of comparison it is assumed that timber is purchased from the sawmiller, worked up into boxes at a central plant, and distributed to butter-factories in an assembled form. Compared with the existing $\frac{1}{2}$ in. box the following savings should be effected by the use of the proposed metal-strapped package :—

	d.
Saving in initial cost of package	$4\frac{1}{2}$
Less cost of two straps	$1\frac{1}{2}$
Net saving in cost of package	3
Saving in freight, 6 per cent.	$3\frac{1}{2}$
Total saving per package	$6\frac{1}{2}$

If the box-manufacturer carried out the complete operation of saw-milling a further saving of 2d. to 3d. per box might be effected. Similarly, with a veneer plant a further saving of 3d. to 4d. might be made.

TENTATIVE SPECIFICATION FOR PROPOSED STANDARD METAL-STRAPPED BUTTER-BOX.

Section A : General.

(1.) Definition : The box as herein specified shall be known as the " Standard Metal-strapped Butter-box."

Section B : Timber.

(2.) Woods used : The following timbers shall be admitted under this specification : White-pine (*Podocarpus dacrydioides*) ; silver-beech (*Nothofagus Menziesii*).

(3.) Material : (*a.*) The ends, sides, top, and bottom of the box shall be well manufactured, and shall be cut true to size. All defects in the timber which materially lessen the strength of the part, or expose contents to damage, or interfere with proper nailing, shall be prohibited. (*b.*) The wood shall be thoroughly seasoned, and shall have a moisture content of not less than 10 per cent. nor more than 15 per cent., based on the weight of the wood after oven-drying to a constant weight.

(4.) Dimensions : (*a.*) The inside dimensions of the box shall be $15\frac{1}{8}$ in. × $10\frac{13}{16}$ in. × $10\frac{9}{16}$ in. The width of sides, top, and bottom shall be $10\frac{13}{16}$ in. (The top and bottom do not cover completely the edges of the sides, which will be sprung inwards when the strapping is applied. This will assist to keep the strapping in tension.) (*b.*) The sides, top, and bottom shall be $\frac{5}{16}$ in. in thickness ; the ends shall be $\frac{1}{2}$ in. in thickness. (*c.*) The variation in thickness of the boards below the thickness specified shall be not more than $\frac{1}{32}$ in., and this variation below the specified thickness shall not extend over more than 10 per cent. of the face of that particular board.

(5.) Width of parts : (*a.*) The maximum number of pieces allowed in any side, end, top, and bottom shall be two, but in no case shall two-piece sides be fastened to two-piece ends. (*b.*) No piece less than 3 in. face-width at either end shall be allowed in any part. (*c.*) Matched and glued or lock-jointed boards shall be regarded as single pieces.

(6.) Jointing : (*a.*) All two-piece parts shall be match-jointed. (*b.*) Two-piece ends shall, in addition, be fastened with not less than two galvanized corrugated fasteners, 1 in. by $\frac{3}{8}$ in. (*c.*) All corners shall be chamfered.

(7.) Surfacing : (*a.*) The outside surfaces of the sides, top, and bottom may be fine band-saw or veneered finish ; otherwise they shall be smooth-planed. (*b.*) The ends of boxes shall be veneered or smooth-planed finish.

(8.) Assembling : Joints in two-piece sides shall be so located that there is onsiderable distances between their respective planes.

Section C : Nailing.

(9.) Nailing schedule : (*a.*) 1½ in. standard cement-coated box-nails shall be used. (*b.*) Nails shall be driven flush. (*c.*) The sides shall be attached to the end grain of the ends by not less than seven nails. The tops and bottoms shall be attached to the side grain of the ends by not less than six nails. (If other than cement-coated nails are used one more nail per edge must be driven.) (*d.*) No piece shall have less than two nails at each nailing end.

Section D : Metal Strapping.

(10.) Metal : (*a.*) Metal strapping shall be preferably of unannealed metal, and shall have a maximum tensile strength of approximately 84,000 lb. per square inch. (*b.*) The strapping for export boxes shall be galvanized or otherwise treated to protect against rust.

(11.) Fastenings : The ends of straps shall be fastened in such a manner that the joint shall have a breaking-strength of not less than 75 per cent. of the ultimate strength of the binding.

(12.) Size of strapping : The metal strapping shall be not less than ⅜ in. in width by 0·018 in. in thickness.

(13.) Application : (*a.*) Not less than two strappings shall be used, placed round the smallest dimension of the box at right angles to the edges of the box. The distance of the outer strappings from the ends shall be approximately 2¾ in., and any others, if used, shall be spaced equally between the two outer straps. (*b.*) The strapping shall not be applied until immediately before shipment of the box, and shall be drawn sufficiently tight to sink well into the edges of the box and to spring the sides inwards.

3. THE WIRE-BOUND BOX.

Wire-bound boxes are especially suited for the carriage of contents which by virtue of their rigidity and other properties absorb considerable shock in themselves. Thicker timber is required for the carriage of other commodities, such as butter, which may be seriously injured by the puncturing of thin material by the corners of other boxes and projecting objects.

Fig. 2 (page 151) shows a "mat" for what is known as a "four-one" box, delivered by a stitching or fabricating machine, ready to be assembled with the end panels, or shipped in this form to the consumer. The cleats are held to the sheet material forming the sides, top, and bottom, by staples which pass over the wires, through the sheet material, and have their points firmly held in the cleats. Staples not driven into cleats are clinched in the inside surface of the sheet material. The box is assembled by folding the mat around the two end pieces, which are stapled or nailed on the inside surface of six of the cleats, the remaining cleat on each end being attached to the top only, as shown in Fig. 3. To close the box the binding-wires are twisted together near one edge of a side. The end joints of the cleats may be mortise-and-tenon, step, or plain mitre type. This four-one box has been used by the Victorian dairy industry for many years.

There are a number of similar boxes on the market, the chief variation being in the method of attaching the ends. One type, for example, attaches only two cleats at each end of the mat, the remaining cleats being stapled to the ends. In assembling the box the sides are stapled to the two cleats attached to the ends. This has the advantage of requiring only an outside stapling-machine, compared with an inside stapler required for the four-one type.

Wire-bound boxes are opened for grading and inspectional purposes by cutting the wires at their original fastenings. They are closed by twisting on a new piece of wire to one of the loose ends and twisting the two wires together again.

WIRES AND STAPLES.

Wire bindings are usually of annealed metal of a minimum size of No. 16 S.W.G.

The staples over all wires are spaced from $1\frac{3}{4}$ in. to $2\frac{3}{4}$ in. apart. It has been found that with $1\frac{3}{4}$ in. spacing the end binding-wires do not slip off the corners of the box so frequently as when the spacing is greater. Staples will not, as nails do in nailed strapping, hold for long the tension in the wire. Nevertheless the wires and staples should be so applied that when the mat is assembled around the ends the wires are in tension at the corners. If boxes are distributed in the mat each dairy factory will require to install a stapling-machine, at an approximate cost of £90 for an outside stapler or £300 for an inside stapler, depending upon the type of box used.

PROTECTION AGAINST RUST.

The greatest disadvantage attached to the use of the wire-bound package is the rusting of staples on the inside surfaces of the box, thus tending to stain both the parchment paper and the butter. This is a universal complaint against the Victorian box. The United States Bureau of Animal Industry, for the same reason, does not recommend the box. It should not be impossible, however, to eliminate this trouble by covering the exposed surfaces of the staples with a protective coating. The use of galvanized wire for the centre staples is not a complete solution of the problem, as the sheared-off ends of the staples expose unprotected metal when clinched over on the inner surface of the box.

Shipping containers are frequently subjected to adverse moisture conditions, and for that reason the wire should be treated to resist rust.

TIMBER.

Either veneer or sawn timber may be used, but, as in the case of the metal-strapped box, the wood must be thoroughly seasoned. The sheet material forming the sides, ends, top, and bottom should be a full $\frac{1}{4}$ in. in thickness, as the Victorian authorities have found that thinner material results in excessive breakages. The finish of the timber is the same as that used for the metal-strapped box.

ECONOMICS.

On the same basis as the metal-strapped box costs—that is, purchase of sawn timber from the miller, fabrication at a central plant, and distribution of boxes in the mat form—the following savings per box may be effected: On initial cost of package, $4\frac{1}{2}$d.; on distribution freight charges, $\frac{5}{8}$d.; on freight, 1d.: total saving, $6\frac{1}{8}$d.

Further savings due to the operation of sawmill or veneer plant by the box-manufacturer will be approximately the same as for the metal-strapped box—that is, 2d. to 3d., and 3d. to 4d. respectively.

FIG. 2. "MAT" OF THE FOUR-ONE WIRE-BOUND VENEER BOX.

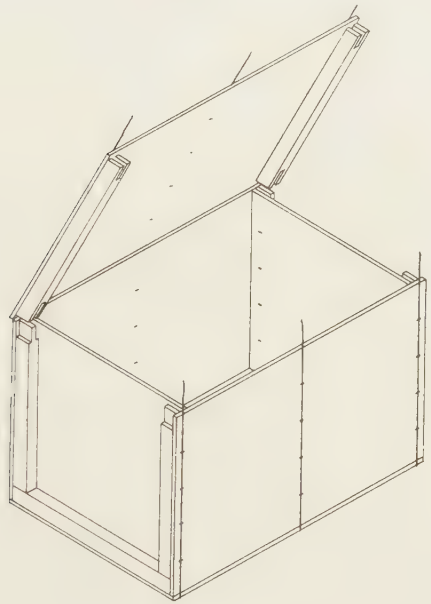


FIG. 3. THE FOUR-ONE BOX ASSEMBLED.

TENTATIVE SPECIFICATION FOR PROPOSED WIRE-BOUND BUTTER-BOX.

Section A : General.

(1.) Definition: The box as herein specified shall be known as the "Standard Wire-bound Butter-box."

(2.) Description: (*a.*) The boxes knocked down shall consist of separate sections forming top, sides, and bottom, connected only by continuous steel binding-wires, and of separate ends. (*b.*) Each of the separate sections forming the sides, top, and bottom shall consist of a thin board, wire and staples, and cleats where required.

Section B : Timber.

(3.) Woods used : The following timbers shall be admitted under this specification : White-pine (*Podocarpus dacrydioides*) ; silver-beech (*Nothofagus Menziesii*).

(4.) Material : (*a.*) The thin boards shall be well manufactured, and shall be cut true to size. All defects in the timber which materially lessen the strength of the part, or expose contents to damage, or interfere with the proper stapling and assembly of the box, shall be eliminated. (*b.*) Each cleat shall be sound, and free from knots and from cross-grain which runs across it within a distance equal to one-half its length. (*c.*) The wood shall be thoroughly seasoned, and shall have a moisture content of not less than 10 per cent. and not more than 15 per cent., based on the weight of the wood after oven-drying to a constant weight.

(5.) Dimensions : (*a.*) The inside dimensions of the box shall be $15\frac{1}{8}$ in. × $10\frac{15}{16}$ in. × $10\frac{7}{16}$ in. (*b.*) Thin boards shall be $\frac{1}{4}$ in. in thickness. The variation in thickness of thin boards below the thickness specified shall be not more than $\frac{1}{32}$ in., and this variation below the specified thickness shall not extend over more than 10 per cent. of the face of that particular board. (*c.*) Only one-piece thin boards may be used. (*d.*) Cleats shall be not less than $\frac{3}{4}$ in. thick (parallel to the length of the box), and not less than $\frac{7}{8}$ in. in width.

(6.) Surfacing : (*a.*) The outside surfaces of the sides, top, and bottom may be fine band-saw or veneered finish ; otherwise they shall be smooth-planed. (*b.*) The outside surfaces of ends shall be of veneered or smooth-planed finish.

Section C : Wire and Staples.

(7.) Binding-wire : (*a.*) The binding-wire shall be of annealed metal, having a maximum tensile strength of approximately 66,000 lb. per square inch. (*b.*) Binding-wires shall be not less than No. 16 S.W.G.

(8.) Staples : (*a.*) The staples on end wires shall be not less than No. 16 S.W.G. by $1\frac{1}{8}$ in. long. (*b.*) The staples on the intermediate wire shall be not less than No. 18 S.W.G. by $\frac{7}{16}$ in. long.

(9.) Protection against rust : (*a.*) Wires and staples used for export boxes shall be treated to protect them against rust. (*b.*) Before any staples for use on the inside surfaces of the box are approved they shall be required to pass a six months' rust-resistance test under actual service conditions.

Section D : Fabrication of "Mat."

(10.) Driving of staples : (*a.*) The staples on end wires shall be driven home astride the binding-wires, through the thin boards into the cleats, and anchored in the cleats. (*b.*) The staples on the intermediate wires shall be driven astride the binding-wires, through the thin boards, and firmly clinched.

(11.) Spacing of staples : (*a.*) The space between staples shall be the average distance between centres of staples astride each binding-wire in each section, and this space shall be not more than $2\frac{1}{2}$ in. (*b.*) The staples nearest the corners shall be not more than $1\frac{3}{4}$ in. from the corner to which they are adjacent.

(12.) Spacing of sections : The separate sections, forming the sides, top, and bottom, shall be separated such a distance from each other that at each corner one section shall overlap its adjacent section at right angles, and the wires shall be in tension when the sections are folded to give a square tight corner.

Section E : Assembly.

(13.) Fastening of ends : (*a.*) Each end of the box shall be securely fastened to the folded mat by staples or cement-coated nails driven into the cleats. (*b.*) The space between staples or nails shall be not less than $1\frac{1}{2}$ in., and there shall be a staple or nail driven $1\frac{1}{2}$ in. from the ends of each side cleat. (*c.*) The staples shall be not less than No. 16 S.W.G. by $\frac{13}{16}$ in. long. The cement-coated nails shall be not less than 1 in.

(14.) Fastening cover : The cover shall be closed tightly, and the ends of each binding-wire twisted tightly together. The twisted portion of each wire shall be not less than $\frac{1}{2}$ in. long. The rough ends of the wires shall be removed, and the twisted portion driven flat against the sides parallel with the binding-wire.

4. CONCLUSION.

Many profitable fields of investigation have been suggested as a result of the foregoing study. The possibilities attached to the wire-binding of boxes and the balancing of wooden-box construction are problems of immediate importance. The nail-holding power of the native woods should be determined, so that the timbers may be properly classified and nailing schedules for them developed. This work will be undertaken as funds and personnel become available.

This report has been rendered possible by the courtesy of the United States Forest Products Laboratory in making available the results of its very extensive experiments on box-construction. The sincere appreciation of all box consumers and manufacturers is due to the staff of that institution, and especially to Mr. C. A. Plaskett, Engineer in Forest Products, who was in charge of the investigations referred to in this report.

FARMERS' FIELD COMPETITIONS.

TARANAKI, WANGANUI, FEILDING, AND RONGOTEA DISTRICTS, SEASON 1923–24.

J. W. DEEM, Instructor in Agriculture.

FARMERS' field competitions in the Taranaki, Wanganui, Feilding, and Rongotea districts were continued in the 1923–24 season on the same lines as in past years, thirteen centres holding competitions, against fourteen in the previous season. It was thought that the dry period in the late spring of 1923 would have a detrimental effect on the weight of the root crops, but the favourable autumn appears to have compensated for this to a great extent. One hundred and forty-eight mangold crops were judged, against 119 last year. Carrot crops also show an increase from 64 to 79. Swedes and lucerne show a slight decrease, the figures being—lucerne, 61 (71); swedes, 30 (63). Soft turnips were 20—the same number as last year. The total of crops judged was 338, compared with 337 in the previous year.

The crops were judged by Instructors Glasson, Smith, McCulloch, and the writer. Mr. McCulloch has taken over the Feilding and Rongotea districts, and shared in the judging there during the past season. Smaller competitions were also held in some districts, and awards made by local judges. As in previous years, farmers turned out in fairly large numbers to see the crops judged and discuss related farming matters. In a few centres a number of senior schoolboys were taken round, and received an excellent optical lesson in how to care for a good crop.

The usual display from the competitions was staged at the Hawera Winter Show, the exhibits being set up under cards indicating the districts they came from and giving full particulars of cultural methods.

It was shown last year that in localities where the competitions have been in existence longest the average crop is gradually increasing,

and this has been further emphasized this year. The general care and careful cultivation given are very gratifying to all interested, and to the judges in particular, it now being quite rare to see a neglected crop.

MANGOLDS.

Taking the various districts where competitions are held, the mangold has pride of place, the 148 crops judged this year giving an average of 65 tons 2 cwt., against an average of 53 tons 12 cwt. last year, or an increase per acre of 11½ tons.

The following table gives the averages for the Taranaki, Wanganui, Feilding, and Rongotea districts :—

District.	1920–21.		1921–22.		1922–23.		1923–24.		Four Years' Average.	
	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.
Taranaki	51	9	56	18	54	19	64	9	56	18¾
Wanganui	44	1	56	18	65	19	73	13	60	2½
Feilding	33	19	46	10	42	15	62	1	46	6¼
Rongotea*	..		..		57	2	66	17	61	19½

* Two years only.

The various championships in 1923–24 were won as follows :—

Taranaki : Mr. Fred. Hoskin, Matapu, Prizewinner Yellow Globe, 96 tons 19 cwt. Mr. C. Willis, last year's winner, did not compete this year.

Wanganui : Mr. H. Birch, Maxwelltown, Prizewinner, 116 tons 15 cwt. This is Mr. Birch's third win in succession.

Feilding : Mr. H. V. Benge, Feilding, White Sugar, 93 tons 4 cwt.

Rongotea : Mr. E. Nix, Kopane, Prizewinner, 110 tons 3 cwt.

These crops also win the Sutton Cup for their respective districts. As Mr. Birch has gained first place three years in succession he now wins the cup right out, and the writer takes this opportunity of publicly congratulating him on his very fine performance. His crops for the three years were : 1922, 88 tons ; 1923, 93 tons 5 cwt. ; 1924, 116 tons 15 cwt.—an average for the three years of 99 tons 6⅔ cwt. Messrs. Sutton and Sons, through their New Zealand agents, Messrs. J. G. Ward and Co., recognizing the tangible results that are being obtained from these competitions, have agreed to give another cup to replace the one won by Mr. Birch, and have also promised a cup next season for north Taranaki if competitions are started there. This makes a total of six cups for the districts in question since 1922, and as the firm makes no restriction as to whose seed is used their assistance is very highly appreciated.

Varieties.—An analysis of the crops grown in the competitions shows that Prizewinner won twelve out of thirteen competitions, the other being won by White Sugar. Then, if the ten heaviest crops in all the competitions are taken, it is found that seven were Prizewinner, two a mixture of Prizewinner and White Sugar, and the other White Sugar. Prizewinner is the variety most commonly grown in these districts, and it seems to do wonderfully well in all classes of soil ; at the same time, White Sugar and Jersey Queen are running it very close in some

localities. White Sugar has the great advantage of being a great germinator and a wonderfully quick grower in the early stages. Long Red continues as the poorest all-round mangold grown in these districts, but Red Intermediate is promising better.

The 148 crops in the competitions this year give the following figures: Prizewinner, 89 crops, average per acre 68 tons 8 cwt.; mixture of Prizewinner and White Sugar, 15 crops, average 68⅔ tons; mixture of Prizewinner and Jersey Queen, 8 crops, average 64 tons 6 cwt.; White Sugar, 7 crops, average 69 tons 1 cwt.; Jersey Queen, 9 crops, average 57 tons 13 cwt.; Long Red, 14 crops, average 54¾ tons; Golden Tankard, 3 crops, average 52 tons 13 cwt.; mixed varieties, 3 crops, average 61 tons 17 cwt. per acre. In some parts there was a considerable amount of heart-rot this year, and it was mostly confined to Prizewinner Yellow Globe, White Sugar being practically free even in fields where it was grown mixed with affected Yellow Globes.

Manures.—The competitions again emphasize the fact that most of the manures supplied for growing mangolds will give good results, provided they are used liberally and assisted by good cultivation both before and after the crop is sown. The following are the manures used on the winning crop in each district: Maxwelltown (yield, 116 tons 5 cwt.), superphosphate and bone, equal parts, 8 cwt. per acre, plus 2 cwt. salt and ½ cwt. nitrate of soda applied at thinning-time; Rongotea (110 tons 3 cwt.), 2½ cwt. mangold-manure; Matapu (96 tons 19 cwt.), mangold-manure, 4 cwt.; Feilding (93 tons 4 cwt.), mangold-manure, 5 cwt., plus salt 3 cwt.; Otakeho (90 tons 18 cwt.), super 3 parts, bone 1 part, Ephos 1 part, 6 cwt.; Manaia (87 tons 11 cwt.), super and bone, 4 cwt.; Mangatoki (84 tons 10 cwt.), bone, super, and blood-and-bone, equal parts, 5 cwt.; Toko (78 tons 12 cwt.), super, bone, and slag, equal parts, 6 cwt.; Brunswick (78 tons 6 cwt.), mangold-manure, 5 cwt.; Auroa (72 tons 11 cwt.), half basic super, half kainit, 5 cwt. per acre. These particulars are given as a guide to the respective districts. It is obvious that it would not be fair to compare Toko, for instance, with Feilding, as the growing of a 78-ton crop at Toko is a better performance than a 93-ton crop at Feilding when the differences in land and climate are taken into consideration.

Date of Sowing, Seed per Acre, and Width of Drills.—These, again, vary considerably, but the average of the good crops seems to be 6 lb. of seed, and drills 24 in. to 26 in. apart. There is no doubt that very heavy crops can be grown in 21 in. drills, but this entails a lot of hand-work. The competitions have proved very definitely that the Globe varieties can be grown in much closer drills than Intermediate or Long varieties such as Sugar, Jersey Queen, or Long Red. The latter type of mangold grows a much heavier top, and requires more room to admit sufficient light to the roots. The dates of sowing also show a wide range, but it is safe to say that any time between 15th October and 15th November is quite suitable for most of the localities. The warmer the situation the earlier can the crop be sown, but when the situation is 500 ft. or more above sea-level the end of October is early enough. In thirty-three placed crops sixteen were sown between 1st and 15th November, with an average yield of 80 tons 11 cwt., and seventeen crops between 1st and 30th October, with an average yield

of 77 tons per acre. The following table, comprising some of the winning crops, is of interest :—

Locality.	Yield of Crop.		Date sown.	Seed per Acre.	Width of Drills.	Average Yield for Competition.	
	Tons	cwt.		lb.	Inches.	Tons	cwt.
Maxwelltown	116	15	Oct. 1	10	22	73	13
Rongotea	110	3	Nov. 14	8	24	66	17
Matapu	96	19	Oct. 20	5	21	74	17
Feilding	93	4	Nov. 5	4	30	67	1
Otakeho	90	18	Nov. 15	7	21	68	5
Manaia	87	11	Oct. 28	6	28	64	0
Mangatoki	84	10	Nov. 7	6	21	64	13
Toko	78	12	Oct. 26	6	26	65	9
Kiwitea	78	11	Nov. 4	3	26	57	1
Brunswick	76	6	Nov. 4	4	28	58	1
Auroa	72	11	Nov. 2	8	21	56	2

SWEDES.

The swede crops in general were very poor. In some districts there were large entries for the competitions, but the majority of the crops rotted before judging-time. The thirty crops judged gave an average of 32 tons 19 cwt. per acre, against 34 tons 7 cwt. last year. No varieties appear to stand out very prominently. The winning variety and respective yield per acre in each district were as follows: Manaia, Magnum Bonum, 50 tons; Otakeho, Grandmaster, 46 tons 18 cwt.; Toko, Superlative, 30 tons 17 cwt.; Kiwitea, Webb's Empire, 55 tons 16 cwt.; Apiti, Vilmorin's Purple-top, 57 tons 7 cwt.; Feilding, Magnum Bonum, 30 tons 11 cwt.; Matapu, Grandmaster, 36 tons 16 cwt.; Mangatoki, Magnum Bonum, 37 tons 15 cwt.

All sorts of fertilizers have been tried, but they do not appear to have any effect on the amount of rot. As a rule, the later the crop was sown the freer it has been from rot.

CARROTS.

This root continues to come more and more into favour, both in cattle and sheep districts, no doubt owing to its freedom from disease and excellent feeding-qualities. Matchless White and White Belgian are most favoured for cattle, but some very fine crops of Sinclair's Champion and Barriball are also seen. For sheep-feeding Guerande gives best results, as the roots do not require thinning or digging. The carrot crop as a whole this season promised to be very good, but a severe storm accompanied by salt spray in March cut the tops about badly, particularly in exposed positions near the coast, where they were completely blackened, with the result that root-development practically stopped, the plants using their energy to send out new leaves. Where the plants had not been too badly knocked about they were successful in growing new tops, but in other cases the crop rotted badly. The average yield for the seventy-nine crops judged this year was 38 tons

10 cwt., against 41 tons 4 cwt. last year, the district which suffered badly from the salt spray being responsible for a large reduction in the average. For example, the average for Otakeho this year was only 27 tons 4 cwt., against 40 tons 18 cwt. last year, and the crops appeared to have been better cared for. The heaviest individual crop this year was 67 tons 4 cwt., against 62 tons 3 cwt. last year.

Analysing this year's competitions it is found that forty-four Matchless White crops average 37 tons 4 cwt. per acre; twelve White Belgian, 39 tons 18 cwt.; ten Sinclair's Champion, 31 tons 10 cwt.; seven mixed crops, 31 tons 11 cwt.; two Barriball, 50 tons 16 cwt.; two Magnum Bonum, 26 tons 6 cwt.; two Yellow Intermediate, 23 tons 1 cwt. The following table gives the weight of winning crops, date of sowing, seed per acre, and width of drills in a number of the competitions, also the average of the respective competitions:—

Locality.	Yield of Crop.		Date sown.	Seed per Acre.	Width of Drills.	Average Yield for Competition.	
	Tons	cwt.		lb.	Inches.	Tons	cwt.
Maxwelltown ..	67	4	Nov. 3	1	27	47	8
Matapu	57	7	Oct. 14	1	14	38	14
Manaia	51	13	Oct. 19	1¼	15	35	14
Brunswick	51	8	Nov. 1	1	14	45	19
Toko	50	18	Sept. 25	4	14	36	7
Kiwitea	47	17	Oct. 28	½	28	43	9
Otakeho	41	18	Oct. 25	1½	14	27	4
Feilding	41	16	Nov. 10	1	30	43	9
Mangatoki	38	13	Nov. 7	1	14	36	0
Auroa	34	19	Nov. 3	1	14	31	6

Manures.—The following was the manure used for the winning crop of carrots in each locality: Maxwelltown, bonedust and super, equal parts, 4 cwt. per acre; Matapu, mangold-manure, 3 cwt.; Manaia, carrots followed potatoes, grown in pig-paddock; Brunswick, 1 part bonedust, 3 parts super, 5 cwt.; Toko, 4 cwt. super, 2½ cwt. slag, 2 cwt. bonedust, 1 cwt. sulphate of potash; Kiwitea, 2 cwt. super, 2 cwt. Ephos; Otakeho, 3 parts super, 1 part bonemeal, 1 part Ephos, 3 cwt.; Feilding, blood-and-bone, 5 cwt.; Mangatoki, 2 cwt. super, 2 cwt. bone, ½ cwt. kainit; Auroa, mangold and carrot manure, 4 cwt. per acre.

Feeding-values.—The remark is frequently heard, particularly when judging root crops, that the red carrot has a very much better feeding-value than the white. The following analyses, made recently by the Department's Chemist, of carrots grown on the Moumahaki Experimental and Stratford Demonstration Farms, show that there is not much difference, and that very-deep-red carrots like Magnum Bonum and Guerande are no higher in feeding-value than Matchless White or White Belgian:—

	Average Weight of Crop. Tons	cwt.	Average Dry Matter. Per Cent.
Sinclair's Champion	27	5	10·41
Barriball	34	15	10·22
Matchless White	36	15	9·47
Guerande	31	5	9·39
Magnum Bonum	31	0	9·35
White Belgian	37	0	9·34

LUCERNE.

The followers of the lucerne competitions this year were very keen, as at judging-time—the end of January—most pastures were burnt up, while the lucerne stood out fresh and green. Some very fine stands were examined, and as feeding-out was prevalent the sixty-one crops judged provided an opportunity of inspection at all stages of growth. Three classes were again provided—namely, stands under twelve months, stands over twelve months and under two years, and mature stands. In the Rongotea district the winning mature stand gained 39 points out of a possible 40. This crop was broadcast on 16th December, 1920, with seed at 23 lb. per acre, and was manured with 2 cwt. of basic super per acre in 1922. The winner in the class under two years gained 36 points. This stand was sown broadcast on 26th October, 1923, at the rate of 12 lb. of seed per acre, and was manured with 1 cwt. of nitrate of soda per acre. Last year the same stand secured 31 points. At Otakeho the winning mature-class crop had been sown through every coulter of the drill with 20 lb. of seed per acre, and manured with 2 cwt. of super and 3 cwt. basic slag ; it had also received ½ ton of lime and 2 cwt. of inoculated soil. This crop gained 39 points out of 40, as compared with only 29 points last year. The class under two years was won with 34 points by a stand sown through every coulter of the drill at 15 lb. of seed per acre, and manured with 3 cwt. super and 7 cwt. lime. The winning first-year crop, sown on 6th December last, with 20 lb. of seed through every coulter, and manured with 2 cwt. super and 1 ton lime per acre, gained 36 points. At Tokaora the mature-class crop, sown through every coulter of the drill at 20 lb. per acre, and manured with 4 cwt. basic slag and 10 cwt. lime, gained 39 points. The two-year-class crop, sown on 24th December, 1922, with 15 lb. seed cross-drilled through every coulter, and manured with basic super 2½ cwt. and carbonate of lime 9 cwt. in 1921, and burnt lime 10 cwt. in 1922, gained 33 points. The under-twelve-months crop, sown 30th October, with 20 lb. seed through every coulter, and manured with 4 cwt. basic slag and 10 cwt. lime, gained 39 points.

JUDGING A LUCERNE CROP IN THE SOUTH TARANAKI COMPETITIONS.

PLANT-SELECTION AND SEED-PRODUCTION.

WORK AT THE MOA SEED FARM.

(Concluded.)

J. W. HADFIELD, Manager, Moa Seed Farm, Dumbarton, Central Otago.

II. SEED-PRODUCTION—*continued.*

TRANSPLANTING.

In an average winter onions planted in the autumn will give a greater yield than spring-planted bulbs, but here we find the risk rather too great, as many of the bulbs fail to grow. Autumn-planted bulbs root during winter, and throw up vigorous seed-stalks in the spring. If the reverse takes place, and the bulbs shoot before they root, it is an almost certain indication of a poor seed-crop. The ideal bulb for seed purposes is a hard, well-matured bulb, not less than 1½ in. in diameter. Our conditions are such that we find the greatest difficulty in ripening off bulbs before wet weather sets in during March, and we are now endeavouring to overcome this difficulty by growing our bulbs farther into the Central Otago district, near Alexandra, where perfect bulbs for our purpose can be raised. The bulbs are set out 9 in. to 12 in. apart, in drills 3 ft. apart, and covered with about 3 in. of soil. For a few weeks they may be cultivated, but when the seed-stalks develop the danger of damaging these with the cultivator is too great, and it is also inadvisable to disturb the roots, which spread across from one drill to the next.

Parsnips, carrots, mangolds, and beets are transplanted in the order given. Parsnips and carrots are most rapidly transplanted by using a hillside plough, and pushing the roots well down to the crown in the soft, freshly turned soil of every fourth furrow. One man ploughing, a second carting, and a third bagging the roots in cement bags, together with five men planting, forms a very effective working-gang, which is capable of planting over an acre in an eight-hour day. This method is quite effective when the roots can be irrigated soon after planting, or where there is reasonable chance of rain washing the soil well round them. It is not effective, and, in fact, no system of planting is easy in soil that is too heavy or too wet to crumble when worked. The main care in planting should be to see that the roots are planted firmly; and no doubt the most effective way, though slower and very arduous, is to open out drills, drawing the soil to the roots with a short-handled hoe, and trampling the soil firm while planting the next root. The final covering and levelling can then be done with a cultivator. The drills are opened up 4 ft. apart, and the roots spaced 18 in. to 24 in., the depth of the drill being dependent on the variety being planted.

Mangolds and beet are planted in the manner just described, but the drills have to be very deep for long red mangolds. As it is distinctly advantageous to cover these up to the crown if possible, and as it is impossible to open a drill to this depth, it is necessary to hill the soil round the roots, after which cultivation is very difficult and weeds get a good hold.

In all cases the cultivator should be worked as much as possible between the drills. Parsnip is the cleanest crop, as it grows so vigorously as to completely smother any weeds that develop late in the season. If time is available, hoeing between the roots in the early stages of growth is very beneficial.

Light silty soil gives very good results with carrot, parsnip, and onion, but heavier and damper soils give the heaviest yields of mangold and beet seed. Our experience would indicate this to be particularly the case with beet-root.

Onions are liable to many diseases, but carrots, mangolds, and parsnips are particularly free. The later seed-heads or umbels of the carrot become covered with green aphis, but this trouble is rapidly disappearing, and although last season was one of the most favourable we have experienced for aphis development, they were almost absent from the carrot crop. This we attribute almost entirely to the work of ladybirds, which are present in large numbers, and are annually increasing.

HARVESTING THE SEED.

The parsnip crop is the first to ripen, and the first picking is made about the New Year. The central umbels ripen first, and, although the first picking is a very light one, the seed has the best appearance, though its actual bushel-weight is less than that of the smaller seed harvested later. Seed is ready for harvesting when the stalk and seeds show a tinge of brown, but, as this indication may not be present, it is a very difficult matter to clearly describe the stage when ripe enough to cut. A ripe head when shaken gives a sharp rattle, whereas a green head emits a much duller sound. Parsnip-seed is produced in pairs, and if when these are pinched between the fingers they separate readily it is a sure indication that the head is ripe. Given a little instruction and a few hours' practice, a picker is able to select, without mistake, any heads which are fit for the harvest. The heads are cut off with a sharp pocket-knife, and pushed into a sack suspended from around the shoulders. As these fill they are emptied on to tarpaulins and carted to the drying-shed, where they are spread in the sun during the day and taken under cover at night.

During hot weather if the seed-heads are turned frequently they are ready for a first flailing after two days in the sun. The seed is sieved into drying-trays, 6 ft. by 3 ft., and 5 in. deep. These are made of light Oregon timber with hessian bottoms, and will conveniently hold 56 lb., or one sack of seed. These trays are set out on a platform in the sun for several days, and the seed stirred at frequent intervals. When thoroughly dry the seed is tipped out on to the floor, where drying is completed and the various threshings mixed before being bagged.

After the first flailing a large amount of seed still remains on the heads. These are spread out for a second drying, and after a second flailing what little seed remains on the heads is of small value.

The second and third cuts of parsnip-seed from the paddock are the heaviest, and the third cut will include almost everything of any consequence. If, however, the crop ripens unevenly, and there still remains seed on the plants sufficient to warrant the expense, the plants

FIG. 3. CARROT-SEED CROP IN FULL FLOWER AT THE MOA FARM.

FIG. 4. LETTUCE CROP IN HEART.

The hearts have to be slit open to allow the seed-stalks to rise.

may be pulled up by the roots and stooked, placing about twenty plants to the stook, these being held together with binder-twine or flax. After a few days in the sun these stooks are pushed over on to a tarpaulin, when a few strokes from the flail will thresh out any seed, and this can be collected from the tarpaulin beneath.

Parsnip will be mostly harvested by the end of January, about which time the carrot crop begins to ripen. The central umbel of the carrot ripens much earlier than the rest of the seed, a light-brown colour indicating that it is sufficiently mature for harvesting. If left till the other umbels are ripe, which is towards the latter part of February, the former seed is very largely wasted, and if we have the labour available we go through the crop and make a first cut by hand. This is dried similarly to parsnip, but when dry we do not flail it, the heads being bagged and reserved for threshing in the mill when the remainder of the crop goes through.

Carrot-seed does not shed so readily as parsnip, and when the majority of the heads are brown the stalks are cut with secateurs and laid in bundles or sheaves, and tied up with flax. If the bundles are neatly made, and of even length, they can be stooked in the paddock; no ordinary wind will shift them, and very little seed is shed. The stooks remain in the paddock until thoroughly dry, when they are carted to the mill and threshed.

Mangold and beet ripen about the same time as carrot, but generally before the main cut of the latter takes place. The seed in both cases is shed rather easily when ripe, and birds soon cause further loss. For these reasons it is sometimes necessary to make a preliminary cut of this seed also. The stalks are cut and placed in bundles, and may be allowed to dry in the paddock for a day or so if the weather is settled. It is important that this seed shall not get wet, as it is not only difficult to dry out again but the seed is discoloured, and there is a loss of germination. We do not tie up the bundles. They are carted to a central position, where they are placed upright on old canvas or sacks, making stooks half a chain or so in length. In the event of rain, they are covered with tarpaulins, and are generally turned and restooked once during drying. The drying-process is rapid, and within a week they should be fit to be built into small stacks 4 ft. wide and about 6 ft. high. Drying and ripening continues in these stacks, and by the time the main crop of carrot is ready for threshing out of the paddock they can also be carted and threshed.

The best beet and mangold seed is saved by pulling up the entire plant, including the root, and hanging it up to dry and ripen. This method, however, is only practicable in raising stock seed where the additional expense is warranted.

Onions require two cuts as a rule. Here, again, the best seed is saved by cutting the stalks near the ground and hanging them up to dry. In this instance, however, careful attention must be paid to ventilation, otherwise heads which are touching become mouldy long before they become dry. Heads are ready for cutting when the seed "pods" or heads commence to open, showing the black seed within. The heads are cut off with very little stalk attached, and are spread out to dry. Drying is a very slow process, and the heads must be

constantly turned to avoid mould. We have never grown sufficient onion-seed to warrant threshing in a mill, but this is the usual practice in California.

The onion is one of the last crops to ripen, generally about the second week in March, and we have always experienced great difficulty in drying and threshing. It is also a most erratic yielder, and we are not at all certain that we can deal with this seed commercially. Factors altogether outside of our control contribute to this uncertainty. Sunburn, hot winds, and cold winds during blossoming-time all detrimentally affect the setting and filling of seed; besides, there are probably a score of other diseases and tribulations to which the onion crop is liable.

FIG. 5. ROGUING ALDERMAN PEAS.

RESIDUES.

It is said that growing onion-seed improves the land. Whether this is true or not, we certainly do not find the other roots have any beneficial effect, even though the cultivation is necessarily very deep. Carrots and parsnips are all absorbed into the stem. On wet soil, however, onions will throw up a second and even a third crop of seed-heads in successive years, but the stand is very thin and never warrants the saving. Mangold particularly, and beet to some extent, can be used for pig and rough cattle feed after a crop of seed has been removed. They are somewhat hard and woody, but we invariably use them till the autumn, when more palatable and nutritious roots are available.

The stalks of carrots and parsnips are difficult to dispose of. We find the most effective way is to disk and cross-disk the land, and leave the stalks to lie till winter ploughing.

THRESHING.

We have in use on the farm a No. 2 Keystone peg-drum mill, driven by a 6-horse-power oil-engine. Considering the great variety of uses to which the mill is put we get remarkably good results from this one machine. Three or four men are required to thresh and handle root-seeds, but five to six are required for cereals and peas. We have put through 33 bushels of peas, 48 bushels of wheat, and 84 bushels of oats each in one hour, but the threshing of root-seeds is always a very slow process.

DRESSING.

We do not at present make any attempt on the farm to dress seed for market, with the exception of cereals, sweet-pea, and onion seed. Parsnip-seed is put over a fan mill with the object of removing the stalks. Mangold-seed and beet-seed may require further drying before being bagged, and they also are passed over a fan mill to remove sticks, small seed-clusters, and dust.

Onion-seed requires special treatment. It is dressed through a fan mill, but this does not remove all the impurities, nor does it remove light seed which contains no kernel. After a preliminary dressing the seed is poured slowly into water and thoroughly stirred. Chaff and light seeds float to the surface, where they can be skimmed off. The good seed sinks to the bottom, and is poured over a fine sieve, and from thence to drying-trays. The seed should not be under water for more than a few minutes, and half an hour would probably constitute the limit beyond which the seed is liable to suffer in germinating-power. Rapid drying is also essential, and for this reason it is advisable to perform the operation in the forenoon, allowing the hot afternoon sun for complete drying before night. The seed apparently can stand very low temperatures, and we have had seed, which we were unable to dry, frozen overnight, but which still showed quite a satisfactory germination. After drying, the seed is passed two or three times through the fan mill and is ready for market.

The cost of machine-dressing carrot and parsnip seed is an item which represents a considerable proportion of the cost of production. In carrot-seed it has cost us from 15 per cent. to 19 per cent., in parsnip 7 per cent., and in mangold 10 per cent., of the value of the finished product. Garden peas, on the other hand, cost only about 3 per cent. of their value in dressing. In machine-dressing carrot-seed there is approximately a 40-per-cent. loss in weight, due to the removal of the beard from the seed; while the loss in parsnip and mangold is about 5 per cent. to 7 per cent., and depends upon the amount of rubbish removed by the fan mill before the seed is machine-dressed.

RADISH AND LETTUCE.

We have grown radish-seed for three years, and have finally decided we cannot handle it profitably Birds have always taken the greater part of the seed long before it is ready for harvest, and to save even half a crop we have to cut before it is mature. Threshing also offers difficulties which we have not been able to overcome with our mill.

FIG. 6. GENERAL VIEW OF NAMED VARIETIES OF SWEET PEAS.

FIG. 7. NAMED VARIETIES OF SWEET PEAS GROWN ON STAKES.

We have also grown lettuce-seed experimentally for some years. It is a crop which does exceptionally well here and produces excellent hearts, but we have had no success with seed-production. The hearts require to be cut open to allow the seed-stalks to come through, and later the lower leaves are stripped off the plant. Even very early spring sowings have always failed to set seed, although the plants flower profusely, and we would attribute the failure to cold weather and light frosts about the time seed should be setting. Autumn sowing results in an earlier crop, and the seed sets, but the yield and quality are not up to a satisfactory standard, and we have practically decided to eliminate this crop also.

SHORT-CUTS IN SEED-GROWING.

There are methods of raising seed which might be most correctly described as short-cuts. Biennial crops do not require two full seasons to produce seed. Most roots such as turnips, carrots, and beet-root, if sown during the late summer, will form small-sized roots before the winter. These are very easily and economically handled, and can be set out in the spring with little expenditure of labour as compared with that required for planting large roots. These small roots seed quite satisfactorily, and thus afford a most economical method of production. Sowing in close drills a few inches apart is another means of raising small roots which are easily handled.

In growing parsnip-seed we incur a great deal of expense in harvesting, sorting, and transplanting the roots. This work is not essential, as these roots, and many others, could in most cases be allowed to seed where they grow.

Such methods afford a means of considerably reducing the cost of production, and their adoption, whether we like it or not, is probably inevitable if we are to successfully compete with imported seed.

One point, however, should be stressed, because it is of the greatest possible significance. These roots, whether left in the ground to seed or lifted and transplanted when quite small, cannot be satisfactorily examined and culled, and unless the grower adopts certain precautions the risk is too great, and he will produce seed which can at best be described as of very doubtful purity.

In the first instalment of this article the raising of stock seed was discussed, and where such a system is adopted with success the purity of this seed is such as to warrant the grower in taking the risk. After four years we have produced stock seed which we consider to be very superior, but we have not yet deemed it wise to dispense with culling and transplanting.

Another method, applicable, for example, to beet-root, is to reserve separately the seed from a large number of plants. A small sample from each is sown in the spring as a purity test. The rest of each sample is sown separately in the late summer. When these latter roots are ready for lifting, the purity and quality of each strain can be ascertained by examining the purity test of the sample sown in the previous spring, and those showing bad types are discarded. The loss in discarding these is not great, as the cost of producing the roots thus far is very little.

COST OF PRODUCTION.

The cost of production on the Moa Farm has been high, and one could hardly expect otherwise considering the methods we adopt at present. This statement is made in a general way, since we are not in a position to state just what is the cost of production of any one kind of seed. This is affected by many factors—mainly the yield—and we can do little more than indicate the price around which farmers would have to be prepared to grow for the seed-merchants in order to successfully compete with the price of imported seed. This information is tabulated below, together with other data which may be of interest. The writer is indebted to Mr. R. D. Nimmo, of Messrs. Nimmo and Blair, Dunedin, for assistance in arriving at certain of these figures. Free use has also been made of the American Seed Trade Buyers' Guide for 1924, published by *Seed World*.

Crop.	Approximate New Zealand Contract Price between Grower and Seed-merchant, 1924.	Average Price paid by American Importers f.o.b. Port of Origin, 1921–22 (Duty not included).	Average Yield per Acre on Moa Seed Farm.	Average American Yield per Acre, 1918–22.	Remarks.
	Per Pound. s. d.	Per Pound. s. d.	lb.	lb.	
Parsnip ..	0 10	0 7	1,400	670	N.Z. imports mainly from England, but large quantities produced locally for domestic use.
Carrot ..	1 3	1 3	500	470	N.Z. imports mainly from Britain, U.S.A., and France, and a considerable area grown in N.Z. for local use.
Beet ..	0 9	0 8	800	780	N.Z. imports mainly from Britain and U.S.A. Some also grown in N.Z.
Mangold ..	0 6	0 6½	1,200	860	N.Z. imports from Britain. Some also grown in N.Z.
Onion ..	2 6*	3 3†	‡	320	N.Z. imports cheaper varieties from Australia and more expensive sorts from Britain. Very little grown in N.Z.
Lettuce ..	3 6	No imports	‡	320	N.Z. imports from U.S.A. and the Continent. Not much grown in N.Z
Radish ..	0 8	0 10	200§	225	N.Z. imports from U.S.A. and England. Not much grown in N.Z.
	Per Bushel.		Bushels.	Bushels.	
Garden peas	7 6‖	..	25	14	No import trade. N.Z. exports annually about 75,000 bushels of garden peas, and this forms the main export line in garden seeds.

* Refers to cheap varieties, mainly Brown Spanish. † Includes the more expensive varieties. ‡ Not recorded. § Difficult to estimate; we have harvested 400 lb. per acre, but most of our crops have failed. ‖ The price varies this season from 6s. 3d. to 10s. per bushel according to variety.

AGRICULTURAL EDUCATION IN THE UNITED STATES.

THE WASHINGTON AND OREGON STATE COLLEGES.

Paper communicated to the New Zealand Board of Agriculture by Mr. JAMES BEGG, Otago member of the Board.

WHILE recently visiting the west coast of the United States I took the opportunity to see two of the State colleges which include in their activities a college of agriculture. The colleges of the States of Washington and Oregon were the most convenient for me to visit, and an additional inducement lay in the fact that climatic conditions there more nearly approximate to conditions in New Zealand than do those of any other States in the Union. The coast belt was originally covered with heavy forest, and is dairying and mixed-farming country with a heavy rainfall and a warm summer, and a winter that is free from the excessive cold of inland and eastern America; it is comparable to parts of our North Island. The central portion of these States is arid country with a 6 in. to 10 in. rainfall, hot summers and cold winters, very fertile under irrigation, and approximating the conditions in Central Otago. In the eastern belt the rainfall increases to 15 in. to 25 in.; the country is gently rolling, and is used principally for wheat-growing, resembling North Otago and Canterbury. The mountainous country is covered with forest at the higher levels, and a large number of sheep are grazed in these forest reserves. There is a growing fat-lamb industry on the irrigated lands bordering on the sheep-ranges.

To reach the little town of Pullman, where the State College of Washington is situated, it is necessary to travel right across that State to its eastern border. Coming from New Zealand, where the State institutions are nearly all placed in or near the large cities, it seemed strange to find this great College away in the extreme back country of the State. It seems that under State law in Washington no county can have two State institutions till each county possesses one. This law has many advantages. It distributes Government expenditure throughout the State, and tends to prevent congestion in any one centre. Centres of culture are formed remote from the big cities—it is believed that better work is done in colleges away from the distractions of city life.

Pullman has about three thousand inhabitants when the College is not in session, but with the opening of the latter the population doubles. There are two thousand five hundred students, and a very large faculty of professors and instructors. The College is housed in a group of fine buildings on a hill above the town, and overlooking a hundred miles of the richest wheat-growing country in the United States. The system adopted in these States is to have two State colleges, one devoted to the arts, medicine, law, &c., and the other dealing with the arts, music, and the applied sciences. Pullman and Corvallis are in the latter category. Each of the large colleges of agriculture in the Western States specializes in the direction of the requirements of its own State.

Thus the Washington College, at Pullman, gives special attention to wheat, dairying, and mixed farming on dry and irrigated lands; the Oregon College, at Corvallis, leans to dairying, fodder crops, small fruits, and irrigation; while the Berkeley College, in California, devotes a great deal of attention to irrigation and fruitgrowing.

Corvallis is a small town of five thousand inhabitants, situated about sixty miles south of Portland. It lies in the coastal region, which has a generous rainfall. Originally covered with heavy forest, the country has now been cleared, and is used for dairying and mixed farming. The College, like that of Pullman, is housed in a noble group of buildings placed on an estate of about 1,000 acres, which forms the campus, playing-fields, and experiment and demonstration farms. There are some three thousand students.

These colleges are equipped on a lavish scale, funds being provided from various sources. In the case of Pullman, what is known as the "mill-tax levy," which is a percentage of the State revenues, provides £350,000, land grants aggregating 190,000 acres yield £40,000, and other appropriations £50,000. In addition, there are Federal funds assigned to the College, amounting annually to £80,000. The colleges also enjoy numerous private bequests and scholarships, and have further sources of income from tuition fees, &c. It will be seen that the finance is provided for on a generous scale. The cost to a student for fees and board and lodging varies from £80 to £150 per annum. Students are encouraged to attend the college in their home State by substantial concessions in fees. For instance, at Pullman the tuition fee for residents of the State of Washington is 20 dollars, to non-residents of the State 150 dollars.

The following remarks apply to both Pullman and Corvallis Colleges: The subjects dealt with are agriculture, home economics, mechanical arts and engineering, sciences and arts, veterinary science, education, mines and geology, music and fine arts, pharmacy, military science and tactics. This variety gives a very full college life, and agriculture takes an honoured place in the calendar, which is as it should be, and as we hope it soon will be in New Zealand also. About half the students are women, the majority of whom are taking music and home economics; but I had the pleasure of meeting some who had taken a degree in agricultural science, one of whom occupied the position of instructor in soil-analysis and soil-survey. It was a little disappointing to find that only two hundred of the students were taking the agricultural course, but this was accounted for by the very bad times agriculture has been passing through in America. The normal proportion of students of agriculture in these colleges is about 20 per cent. of the whole, and the Principals were confident that the usual proportion would soon be restored.

Pullman College has an estate of about 600 acres attached to it, and this is devoted to experimental and demonstration work. Horses, beef and dairy cattle, sheep, and pigs are bred, and experiments both in breeding and feeding are carried on. Plant-breeding and experiments in growing pasture and fodder crops are conducted, also a vast amount of investigation work dealing with problems encountered by farmers in every corner of the State. The students get their training in a rural

atmosphere, and this, to my mind, is invaluable to the students of agriculture, also very beneficial to the students of the other arts and sciences taught in the College. The idea growing up in some quarters that the science of agriculture can be acquired as well in a city as in rural surroundings is a dangerous and pernicious idea, and is comparable to training a medical student in a college remote from hospitals, and without seeing any of the practical work of his profession.

The courses of study offered in this College are intended to give a thorough training in the field of agriculture as a science. The art or practice of agriculture as a vocation is not lost sight of, but the fundamental purpose of the work leading to the degree of Bachelor of Science is a mastery of the science itself. For this reason the work in agriculture is accompanied or preceded by as thorough training as possible in the sciences which underlie the principles of agriculture—botany, bacteriology, chemistry, physics, and zoology. In addition, English, education, economics, and other electives are given a prominent place, and the complete course is intended to equip the student with a well-balanced education. The completion of such a course prepares the student for intelligent practical farming, for farm-management and farm business, for landscape work, for practical forestry and range-management, for agricultural journalism, for investigating agricultural problems in connection with experiment-station work, for teaching agriculture and the allied sciences, and for extension service or for service in the United States Department of Agriculture. The demand for men trained to fill such positions far exceeds the supply.

Courses are offered in fourteen groups: General agriculture, farm crops, soils, animal husbandry, agricultural engineering, dairy husbandry, plant pathology, poultry husbandry, horticulture, general forestry, range-management, landscape gardening, agricultural journalism, and farm-management and farm business. The student will select the group he prefers, and must file a formal statement of his choice at the Dean's office before the end of the first semester of the junior year. While a candidate for a degree must complete all the required work prescribed in his chosen group, ample opportunity is afforded for selection of subjects from other groups. Students who do not plan to graduate, but desire special work, are given ample opportunity to select such groups of subjects as will best meet their needs, provided that subjects are selected for which the student is prepared.

The students of agriculture do not learn the ordinary work of farming at these colleges. Their time is regarded as much too valuable to be spent in learning how to plough and sow, and handle horses, but they spend a certain proportion of their time on the farm, seeing in practice the principles they have learned in the class-room, being taught how to conduct experiments with exactness, and learning how to pursue investigation to a final conclusion. Judging of live-stock is given an important place as cultivating close observation, training in exact judgment and reasoning, and also ability to state clearly and concisely in writing the reasons for the conclusions arrived at. It must not be inferred, however, that the practical work of farming is ignored. Students are required to get this practical knowledge either before entering the college or during the vacations. The agricultural school, as we know it at Lincoln and Ruakura, is conducted on different lines

to anything I saw in America. The practical work of farming is not taught at the colleges, and I did not hear of any institution where it was taught; it is not considered necessary institutionally.

During the five days I spent respectively at Pullman and Corvallis I had the opportunity of meeting a large number of the students of agriculture. They seemed a very fine body of young fellows, keen and intelligent, and very much interested in their work. Constant contact with students preparing for other walks in life gave them a wider outlook than would otherwise have been the case. They were practically all resident at the colleges, living either in residential quarters or in fraternity houses. These latter are managed by the students themselves, with nominal supervision by the college authorities, and seemed to be very well conducted.

I made inquiries as to what became of the students after taking their degree. Records are kept by the colleges, and information was available of the careers of about 80 per cent. of the graduates. Of these, about half occupied positions as County Agents and as instructors in high schools and colleges, and the other half were engaged in farming, being generally very successful. The large numbers who have only taken a partial course practically all become farmers, and it is found that they often become leaders in the districts in which they settle.

The colleges carry on extension services right through their States. This is done by means of the County Agents. These Agents are appointed by the County Councils from names submitted by the colleges. They are paid in part by the colleges, with subsidies from the County Councils and from the Federal Government. They must be college graduates, and have a practical knowledge of farming. Their duties are to instruct farmers, visit farms when necessary, give lectures to groups of farmers in the different centres, initiate and take charge of boys' and girls' clubs, and assist in promoting community fairs or shows. They have also to assist in solving farmers' problems, and when unable to deal with these to forward them to the college for investigation. They have to report monthly to the college authorities. By this means the college is kept in close touch with farming activities right through the State, and the tendency to become purely academic is checked.

The extension work is regarded as being most important. It is the connecting-link between the farmer and the college, and is the means of recruiting the future students. The members of the boys' clubs are found to be the students of agriculture of the future, but it must be remembered that this result is merely incidental. The object of extension work is to further educate the farmer of the present and the farmer of the future, so as to enable the men and boys on the land to get the benefit of the work carried on in the colleges, and to stimulate the desire for more knowledge. The underlying idea is one of service, and though these methods seem to have been used occasionally as a means of advertising a certain college, it is recognized that permanent success is not attained in this way.

When this system was first introduced the County Agents were regarded by farmers with suspicion, if not contempt, and it took many years to overcome this prejudice. This is now entirely changed. The Agent is welcomed everywhere, and is in such demand that the problem

now is how to supply the services required of him. In the State of Washington only six counties are now without an Agent, and these are remote and rugged districts where mining is the principal industry.

Under the care of the County Agents large numbers of boys' and girls' clubs have sprung up all over these States. The clubs are fostered by the high schools and also by the Chambers of Commerce. In a small country town I was able to see a show organized by a boys' and girls' club. The local Chamber of Commerce voted 60 dollars for some timber, and the boys built all the pens, hurdles, and stands themselves. There were capital exhibits of all kinds of farm stock—cows, ponies, porkers, sows with litters, poultry, honey, preserves, fruit, cereals, vegetables, &c. As far as I was able to gather each exhibit represented the work of the boys and girls. Parents' assistance was discouraged in every possible way. In the aggregate these clubs must represent an immense interest in rural affairs created in the minds of the young people. While extension work among the country community seems to be highly developed, I was assured by the college authorities that they are still only feeling their way, and have by no means finally decided which is the best method of interesting the country population in the higher branches of the science of agriculture.

Washington and Oregon were originally settled by an enterprising but rather ignorant type of farmer. The land is rich, and round Pullman the farmers have been growing wheat for forty years without fertilizers, and last year the whole district averaged 30 bushels to the acre. Little can be done with the older men, and it is the young men that are expected to adopt modern methods. It is very noticeable that they are doing so. The irrigation areas are largely in the hands of young men, and here good farming is the rule, the demand for expert teaching is keenest, and co-operative marketing is most highly developed. Many of the lads before leaving home and starting farming for themselves take a two-years course at the colleges in some special subjects.

During the winter months special courses of lectures are given at the colleges, but these have not been very well attended. It is found necessary to go out among the farmers and hold these instruction classes in the farming centres, a method closely resembling our winter schools of instruction for farmers. The extension service also employs a number of highly technically trained men and women who serve the farmers and their wives throughout the two States. The specialists in dairying, horticulture, soils and crops, farm-management, clothing, poultry, preserve-making, &c., work through the offices of the County Agents. Boys' clubs are encouraged to send teams of three to compete in judging stock at the State fairs. At the Yakima Fair, the most important show in the State of Washington, at which I was present, there was very keen competition among the clubs, and the president assured me that the boys' judging was wonderfully good. Young pedigree animals were awarded as prizes to the most successful of these boys. Extension work goes much further than this—indeed, it is carried on in the primary and secondary schools—but into these activities I had neither time nor opportunity to inquire.

The great problem of the agricultural colleges, of the experimental stations, and of the United States Department of Agriculture has been

that of getting the scientific agricultural knowledge acquired in these institutions into the hands of the farmers for practical use. The methods here described appear to be the best that have yet been devised, but it by no means follows that they cannot be improved upon. All extension work of the colleges is conducted in co-operation with the United States Department of Agriculture under the terms of an understanding entered into between the Department and the colleges. These arrangements are such that they now work without friction.

The college of home economics is closely associated with the college of agriculture, and its aim is largely to assist the wives and daughters of farmers. Its technical experts are scattered through the States, and their services are at the disposal of country women through the offices of the County Agents.

I may seem to have dealt more with the extension services than with the work in the colleges themselves, but have done so because I found that in the latter this was regarded as one of the most important branches of the college work.

Now that University Chairs of Agriculture are being established in New Zealand steps must be taken to place the benefits of the work done in the hands of farmers. The Department of Agriculture must be placed in the closest touch with the colleges, and careers in the Department should be open to our graduates. What methods are best suited to our conditions in order to get the best results is a matter which will have to receive the attention of the Board of Agriculture very shortly. There must be no duplication of effort, and the colleges must be given the freest possible scope for developing their activities.

I would like to express my appreciation of the great hospitality shown to my wife and myself by the College authorities at Pullman and Corvallis. They did their utmost to make our visit both pleasant and instructive, and I can strongly recommend visitors from this country who can spare time to visit one or other of these colleges.

In conclusion, I would ask my colleagues on the Board to excuse these somewhat disjointed notes. I do not pretend to have had either time or opportunity for a close study of a very large and involved subject, but only hope these observations of a passing visitor on holiday will be of some little assistance in carrying out the work we have to do in our own country.

Blackberry Investigation.—The Director of the Fields Division records in his annual report for 1923-24 that a comprehensive set of experiments to discover means for the eradication or control of the blackberry was commenced during the year. These experiments are in the main being conducted in Wairoa County, Hawke's Bay. Blackberry-control constitutes a problem different in kind from that presented by any other weed in New Zealand, and involves a careful study of the plant in the field. The work being carried out includes the ploughing and regrassing of certain areas with a view to the replacement of the weed by useful grasses. On unploughable country an intensive study of the effects of goats is being carried out, and these animals give evidence of being most valuable in some localities in eradicating blackberry. Besides these experiments, others are being devised, employing chemical and biological means against the weed. Under biological means come insects and fungi, and all of these that are likely to be in any way valuable are being studied.

VIVANDIERE'S JERSEY RECORD.

THE DAILY AND CHECK MILK-WEIGHTS.

W. M. SINGLETON, Director of the Dairy Division.

WE are now able to report that Mr. A. Christie's Jersey cow, Vivandiere, has fully qualified for her certificate of record by calving subsequent to test, after the completion of her 365 days of authenticated milking. Two Jerseys and two Friesians have now received certificates under the New Zealand C.O.R. system on yields exceeding 1,000 lb. of butterfat. Details are as follows:—

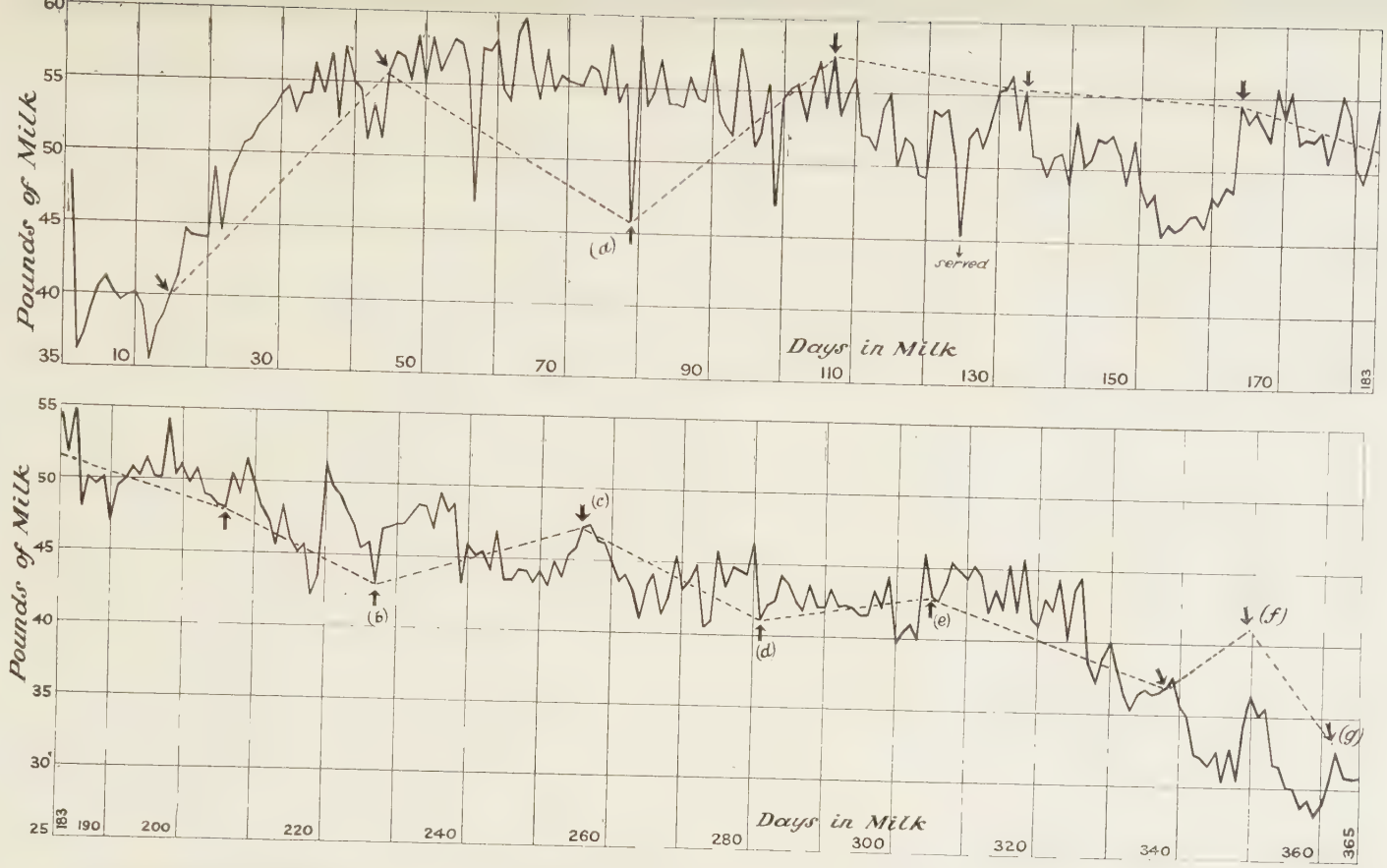
Table 1.

Name.	Days.	Milk.	Butterfat.	Age at Start of Test.
		lb.	lb.	Yrs. days.
Alcartra Clothilde Pietje (Friesian) ..	365	31,312·5	1,145·24	7 357
Hilda Minto de Kol (Friesian)	365	27,773·8	1,046·31	12 56
Vivandiere (Jersey)	365	17,282·1	1,036·09	6 10
Pretty's Flirt (Jersey)	365	16,684·1	1,010·49	6 353

Vivandiere's milk-yield of 17,282·1 lb. also constitutes a New Zealand record for the Jersey breed.

The accompanying graph has been plotted from Vivandiere's daily milk-weights as supplied by the owner, and from the check weights taken by the Dairy Division's testing officer at the time of his visits. The spaces along the horizontal plane represent the days in milk, and the pounds of milk per day are plotted on the perpendicular scale. The daily weights are linked up by the unbroken line, and the dotted line joins the milk-tester's weights, the day of his check weighings being indicated by an arrow-head. The letters (*a*) to (*d*) signify that the Tester has reported to his head office a satisfactory reason for decline in milk-weights on, or just preceding, the date of his visit. As regards (*f*) and (*g*), where the point indicating the check weight on the day of the inspection visit is apart from the main line of the graph, it may be explained that in these cases the Tester happened to commence his sampling at the evening milking, and thus, while his figures would be for an evening and a morning milking, the owner's weights as linked up by the unbroken line are, of course, on the basis of the normal day.

The outstanding features of this graph are the well-maintained milk-flow, and the fact that the owner's milk-weights were well authenticated by the testing officer; in fact, in several instances the latter checked the milk-flow when it was around its maximum for the month. Another check which gives a good indication whether or not the owner's figures may be considered reasonable is to multiply the Tester's check weights by the test and to proportion out the result for the number of days in the month—that is, on the system of compiling herd-testing association



GRAPH SHOWING VIVANDIERE'S DAILY MILK-WEIGHTS DURING HER C.O.R. TEST PERIOD, 4TH AUGUST, 1923, TO 5TH AUGUST, 1924.
(See opposite page for explanation of letters and other signs.)

returns. Vivandiere's production on the day-by-day basis and on the association system is compared in the following table :—

Table 2. Comparison of C.O.R. and Association Results in Vivandiere's Record.

Month.	Days.	Check Weight.	Association Milk.	Test.	Association Fat.	C.O.R. Fat.	C.O.R. Milk.
		lb.	lb.		lb.	lb.	lb.
August ..	25	40·0	1,000·0	5·01	50·10	52·77	1,053·3
September ..	30	55·8	1,674·0	4·87	81·52	80·20	1,647·
October ..	31	45·8	1,419·8	5·52	78·37	94·54	1,712·
November ..	30	57·5	1,725·0	6·05	104·36	98·02	1,620·2
December ..	31	55·4	1,717·4	6·55	112·48	105·35	1,608·4
January ..	31	54·6	1,692·6	6·08	102·91	95·00	1,562·5
February ..	29	48·1	1,394·9	5·89	82·15	86·21	1,463·7
March ..	31	43·0	1,333·0	5·91	78·78	86·83	1,469·3
April	30	47·3	1,419·0	6·59	93·51	87·81	1,332·5
May	31	41·1	1,274·1	6·08	77·16	81·29	1,337·1
June	30	42·9	1,287·0	5·91	76·06	75·47	1,277·0
July	31	36·9 41·1	1,209·0	7·70	93·09	80·28	1,042·7
August ..	5	33·3	166·5	7·92	13·18	12·32	155·6
Totals ..	..	..	17,312·3	..	1,043·07	1,036·09	17,282·1

It will be seen from this table that, based on the milk-weights recorded by the testing officer, the cow would have received credit for 30·2 lb. milk and 7·88 lb. fat more than she actually received on the C.O.R. system.

Table 3. List of World's Jersey Butterfat Records over 1,000 lb.

Name.	Milk.	Average Test.	Butterfat.	Days in Calf. *	Age.		Times milked Daily.
					Yrs.	n.ths.	
Darling's Jolly Lassie (U.S.A.)	16,425	6·95	1,141·28	196	4	0	3
Groff's Constance (U.S.A.) ..	17,942	6·30	1,130·09	†	5	8	3
Princess Emma (U.S.A.) ..	18,437	6·02	1,109·99	†	6	3	4
Lad's Iota (U.S.A.)	18,632	5·62	1,048·07	193	5	6	..
Plain Mary (U.S.A.)	15,256	6·82	1,040·08	182	8	11	3
Vive La France (U.S.A.) ..	15,272	6·81	1,039·29	261	5	11	..
Lady's Silken Glow (U.S.A.) ..	14,939	6·95	1,038·70	†	7	1	..
Vivandiere (N.Z.)	17,282	6·00	1,036·09	240	6	0	2
St. Mawe's Lad's Lady (U.S.A.)	15,229	6·78	1,032·97	†	4	2	.
Vive La France (U.S.A.) ..	14,926	6·91	1,031·64	175	4	7	..
Brown Lady's Little Jewel (U.S.A.)	18,318	5·57	1,019·73	†	5	8	..
Pretty's Flirt (N.Z.)	16,684	6·06	1,010·49	244	6	11	3
Fauvic's Star (U.S.A.) ..	20,616	4·88	1,005·90	194	6	11	4
Eminent's Martha W. of St. Omer (Canada)	19,051	5·26	1,002·00	..	..		..
Sophie's Agnes (U.S.A.) ..	16,212	6·17	1,000·07	216	6	1	3

* Under the New Zealand C.O.R. rules a cow—provided she milks the full 365 days—must be in calf for not less than 192 days during the period of the test in order to qualify for a first-class certificate. † Did not qualify on subsequent calving.

In a brief note in last month's *Journal* we stated that Vivandiere had probably established a world's record on twice-a-day milking. Up to the present we have not been able to trace any reference which

disproves this statement. The Jersey breed, so far as our records show, now has fifteen 1,000 lb. butterfat records to its credit, and among these the New Zealand Jerseys, Vivandiere and Pretty's Flirt, fall eighth and twelfth in the list respectively. Details have been compiled in the accompanying Table 3, including the number of times daily each cow was milked, where known. It is interesting to recall that the first Jersey 1,000 lb. record was not completed until the 30th November, 1918, when Sophie's Agnes was credited with 1,000·07 lb. butterfat.

The sire of Vivandiere is Beachland's King Pin, bred by Messrs. A. Moreland and Son, of Te Rapa. His sire is Brighton Twylish, sire of seven C.O.R. daughters, and Brighton Twylish is in turn by the well-known imported sire, Lord Twylish, sire of ten C.O.R. daughters in New Zealand. On the female side Beachland's King Pin is from Golden Swan's Maid, a daughter of Golden Swan (Imp.), whose name is well known to our Jersey breeders.

The dam of Vivandiere is Loo, bred by Mr. E. Griffiths, of New Plymouth. She has a C.O.R. for 527·91 lb. fat, and is by Roberts (Imp.), sire of nineteen C.O.R. daughters. Roberts is two generations removed from Noble of Oaklands. On the dam's side Loo goes through Belvedere Bilberry and M.L.C. to K.C.B., who appears, three generations back, on both sides of her pedigree. Thus Vivandiere is a combination of many well-known and proven strains.

LOOSE SMUT OF WHEAT.

1. SEED-DISINFECTION BY HOT WATER.

J. C. NEILL, Biological Laboratory, Wellington.

SINCE all the staple crops are propagated by seed, the first essential in obtaining clean crops is to plant seed free from disease. With many diseases reinfection of the seedling may occur from contaminated surroundings, but there are quite a number of others that are carried over from year to year entirely by means of infected seed. The most important diseases falling within the latter category are the cereal smuts, and it is on the problem of their control that the chief researches on seed-disinfection have been conducted. Certain of the smuts, such as stinking smut of wheat, loose smut of oats, and covered smut of barley, which infect by means of spores adhering to the outside of the seed grain, are readily controlled by chemical solutions and dusts, but others, such as the loose smut of wheat and the naked smut of barley, whose means of infection lie deeply buried within the seed, are not affected by treatments which reach the exterior only. Jensen showed, in 1887, that by the application of a certain degree of moist heat it is possible to eliminate this internal infection without materially injuring the seed.

Several subsequent workers have verified Jensen's results and improved on his methods, so that now some variation of the Jensen hot-water method is the standard control measure recommended by plant pathologists for the control of these latter smuts. The treatment also effectively prevents infection by externally carried spores

of the other smuts. The advantages of such a comprehensive treatment are offset by the difficulty of maintaining in practice the exact temperatures required, and for this reason, together with some uncertainty as to the best procedure, the method has had only a limited application. These disabilities do not appear insuperable, and the far-reaching possibilities offered by the method justify the present attempt to adapt it to practical farming in New Zealand. This article presents the results of certain experiments to that end.

THE MODIFIED JENSEN HOT-WATER TREATMENT.

The literature available here shows a good deal of variation in details of the methods recommended by different authors, as the following condensed summary will show :—

Table 1.

Author.*	Presoak in Water.		Treatment.		After-treatment.
	Duration.	Temperature.	Duration.	Temperature.	
Tubeuf ..	None ..	None ..	15 min.	130°–134° F.	Spread out to dry.
McAlpine ..	None ..	None ..	5 min.	131°–135° ..	Ditto.
Güssow ..	4–6 hrs.	68°–86° F.	10 min.	124°–125° ..	,,
Tisdale, &c. ..	4–6 hrs.	Cold water	10 min.	126° ..	,,
Liro	4 hrs...	104° F. ..	10 min.	126°–128° ..	Dry quickly at about 104°
,, (alternatively)	None ..	None ..	12 hrs.	104° ..	Ditto.
Freeman, &c. Brown ..	5–7 hrs.	63°–72° F.	10 min.	129·2° ..	Spread out to dry.

* See "Literature consulted," at end of article.

Unfortunately, very few of these authors give details of the experimental data on which the recommendations are based, and the publications of the Danish and German workers who have most thoroughly investigated the subject are not available here. It has been necessary, therefore, to investigate systematically the effect of hot water on (1) the seed, and (2) the smut. This article is concerned with an investigation into the effects on speed and power of germination caused by certain of the factors involved in the standard methods of treatment. The germinations were conducted in the Biological Laboratory, using a single variety of wheat.

PLAN OF THE EXPERIMENTS.

The method may be divided into three stages: (1) Preliminary treatment, here called presoaking; (2) treatment proper, here called dipping; (3) after-treatment, here called drying.

The factors to be considered in each of these stages are: (1.) Presoaking—(*a*) duration, (*b*) temperature. (2.) Dipping—(*a*) duration, (*b*) temperature. (3.) Drying—(*a*) rapidity, (*b*) temperature, (*c*) duration of storage.

The wheat used was a machine-threshed sample of Major, harvested in February of this year by Mr. T. R. Willis, of "Woodendean," Greatford,

Rangitikei. The crop was badly infected with loose smut, which, by Mr. Willis's estimate, reduced the yield of grain by about 25 per cent.; it had a large percentage of undersized grain, 38 per cent. passing through a 2·5 mm. by 1·2 mm. sieve. Broken grains were not included in the samples tested, which otherwise were a fair sample of the whole. The treatments were carried out in wire baskets in a 5-gallon galvanized-iron vessel, using a single standardized thermometer. Great care was taken to obtain exactitude in both temperatures and times, a reliable thermostat being used for the longer tests.

Germinations were conducted between damp blotting-paper on a substratum of saturated felt, the temperatures ranging from 50° to 60° at night, and from 65° to 70° in the daytime. Germination was recorded on the appearance of both a root and a shoot, irrespective of size. The probable error of the mean percentage was computed by means of Bessel's formula

$$P_e = \pm 0.67 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$$

Unless otherwise stated all treated seeds were dried for four to six hours in air-current at 95° to 104°, and placed in germinators on the following day. All temperatures are given in the Fahrenheit scale.

EXPERIMENTAL RESULTS.

The average germination of the dry untreated wheat (determined on 1,700 seeds germinated at different times during the experiments) was—three-day count, 73·41 ± 3·67; six-day count, 98·35 ± 0·28; nine-day count, 98·47 ± 0·24.

(1.) *Presoaking.*

The effect on the seed of the duration and temperature of the presoak is shown in Tables 2 and 3 respectively.

In reference to Table 2, taking the presoak of five to six hours at 63° as the standard, and comparing it with samples subjected to identical treatment but which had not been presoaked, the germination capacity is about equal under dips up to ten minutes at 127°. Above 127° the presoaked seed rapidly declines in vitality, till at 135° no germination takes place, while the non-presoaked seed still gives a germination of 91·3 per cent. in nine days. Comparing the presoak of sixteen to seventeen hours with the standard five to six hours, both at 63° and followed by a dip of five minutes, there is no appreciable difference in the total germination up to 131°, though above 123° there is a considerable retardation with the longer presoak. Above 131° this retardation becomes more marked and the total germination is considerably lower.

Only two temperatures of presoak are compared in Table 3—63° and 84°—the time in both cases being five to six hours. The rapidity of germination is considerably greater following the higher temperature presoak than following the lower, while the total germination is about equal up to 129° with the five-minute dip, and up to 127° with ten-minute dip. Above these temperatures both speed and power of

Table 2. Showing Effect on Seed of Duration of Presoak.

Temp.	No presoak; dipped 10 min.						Presoaked 16–17 Hours at 63°; dipped 5 min.					
	3-day Count.		6-day Count.		9-day Count.		3-day Count.		6-day Count.		9-day Count.	
	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.
	50	..	97	..	97	..	87	..	90	..	90	..
	50	51	97	96	99	97·3	86	86	98	94·7	99	95·6
121°	53	..	94	..	96	..	85	..	96	..	98	..
	..	±4·6	..	*0·4*	..	±0·3	..	..	..	..	..	..
	..	*47·7*	..	*95·8*	..	*97·1*	..	..	..	..	..	..
	45	..	96	..	96	..	82	..	98	..	98	..
	43	43	94	96	95	96·7	85	82·3	98	97·7	98	98·3
123°	41	..	98	..	99	..	79	..	97	..	99	..
	..	±5·6	..	±0·3	..	±0·3	..	±4·5	..	±0·2	..	±0·2
	..	*47·2*	..	*97·7*	..	*98·7*	..	*70·4*	..	*98*	..	*98·9*
	25	..	94	..	98	..	26	..	97	..	99	..
	23	24·6	94	95	96	97·3	36	31	97	97	98	98·7
125°	26	..	97	..	98	..	31	..	97	..	99	..
	..	±4·6	..	±0·4	..	±0·2	..	±3·8	..	±0·5	..	±0·3
	..	*29·8*	..	*95·6*	..	*98·2*	..	*66·5*	..	*97*	..	*98·1*
	19	..	95	..	96	..	14	..	98	..	98	..
	16	17·3	97	96·3	98	97·7	14	14·7	99	98	99	98
127°	17	..	97	..	99	..	16	..	97	..	97	..
	..	±4·5	..	±0·8	..	±0·4	..	±5·0	..	±0·3	..	±0·3
	..	*24·2*	..	*94·3*	..	*97·6*	..	*43·6*	..	*95·7*	..	*97·4*
	12	..	94	..	98	..	0	..	92	..	98	..
	13	13	92	92·6	99	97·7	0	0	91	91·6	96	96·7
129°	14	..	92	..	96	..	0	..	92	..	96	..
	..	±1·2	..	±1·9	..	±0·4	..	±3·0	..	±0·7	..	±0·4
	..	*3*	..	*75·6*	..	*94·2*	..	*27·7*	..	*94·3*	..	*97·3*
	5	..	93	..	96	..	0	..	63	..	92	..
	6	5·7	91	92·3	97	97·3	0	0	78	67·3	93	92·3
131°	6	..	93	..	99	..	0	..	61	..	92	..
	..	..	..	±4·5	..	±2·2	..	±4·1	..	±1·4	..	±0·5
	..	*0*	..	*35·9*	..	*72*	..	*19·6*	..	*85·8*	..	*93·1*
	0	..	84	..	91	..	0	..	28	..	75	..
	0	0	72	81·6	86	91	0	0	25	27	75	74·6
133°	0	..	89	..	96	..	0	..	28	..	74	..
	..	..	..	±1·3	..	±2·2	..	±1·1	..	±5·4	..	±2·1
	..	*0*	..	*3·5*	..	*17·3*	..	*3·3*	..	*50·2*	..	*83·1*
	0	..	71	..	92	..	0	..	0	..	18	..
	0	0	65	73·3	88	91·3	0	0	0	0	15	16·3
135°	0	..	84	..	94	..	0	..	0	..	16	..
	..	..	..	..	..	..	..	..	..	±2·3	..	±2·9
	..	*0*	..	*0*	..	*0*	..	*0*	..	*14·2*	..	*56·9*
	0	..	33	..	63	..	0	..	0	..	0	..
	0	0	46	38·3	81	70	0	0	0	0	0	0
137°	0	..	36	..	66	..	0	..	0	..	0	..
	..	..	..	..	..	..	..	..	..	±0·7	..	±2·1
	..	..	..	..	..	..	..	*0*	..	*2·4*	..	*31·1*

NOTE.—The figures in italics are extracted from Table 4. These in the left-hand columns are the means of the ten-minute dips; those in the right-hand columns are the means of the five minute dips. In both cases the seed has been presoaked five or six hours at 63°.

Table 3. Showing Effect on Seed of Temperature of Presoak.

Temp.	Presoaked 5–6 Hours at 84°; dipped 5 min.						Presoaked 5–6 Hours at 84°; dipped 10 min.					
	3-day Count.		6-day Count.		9-day Count.		3-day Count.		6-day Count.		9-day Count.	
	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.	Germ.	Mean.
Not dip'ed	..	..	..	..	..	..	97	..	99	..	99	..
							99	97·7	99	98·3	99	98·6
							97	..	97	..	98	..
							..	±1·6	..	±8·3	..	±0·3
							..	*87·5*	..	*97·1*	..	*97·1*
121°	..	..	..	..	..	..	96	..	99	..	99	..
							96	96·7	97	98·3	98	98·7
							98	..	99	..	99	..
							..	±4·6	..	±0·4	..	±0·3
							..	*47·7*	..	*95·8*	..	*97·1*
123°	87	..	99	..	99	..	84	..	98	..	98	..
	87	88·7	99	98·3	99	98·3	89	88	99	98·3	99	98·7
	92	..	97	..	97	..	91	..	98	..	99	..
	..	±4·5	..	±0·2	..	±0·2	..	±5·6	..	±0·3	..	±0·3
	..	*70·4*	..	*98*	..	*98·9*	..	*47·2*	..	*97·7*	..	*98·7*
	92	..	98	..	98	..	67	..	96	..	97	..
125°	94	91·3	99	99	99	99	72	72	98	97·7	98	98
	88	..	100	..	100	..	77	..	99	..	99	..
	..	±3·8	..	±0·5	..	±0·3	..	±4·6	..	±0·4	..	±0·2
	..	*66·5*	..	*97*	..	*98·1*	..	*29·8*	..	*95·6*	..	*98·2*
	82	..	97	..	97	..	65	..	97	..	97	..
127°	92	87·7	98	98·3	98	98·3	64	61	96	96	96	96·3
	89	..	100	..	100	..	53	..	95	..	96	..
	..	±5·0	..	±0·3	..	±0·3	..	±4·5	..	±0·8	..	±0·4
	..	*43·6*	..	*95·7*	..	*97·4*	..	*24·2*	..	*94·3*	..	*97·6*
	79	..	98	..	98	..	23	..	93	..	97	..
129°	86	81·7	98	97·7	99	98·3	17	20	96	94·3	96	96
	80	..	97	..	98	..	20	..	94	..	95	..
	..	±3·0	..	±0·7	..	±0·4	..	±1·2	..	±1·9	..	±0·4
	..	*27·7*	..	*94·3*	..	*97·3*	..	*3*	..	*75·6*	..	*94·2*
	39	..	95	..	98	..	6	..	56	..	87	..
131°	38	37	94	94·3	97	97·3	7	6·7	68	64·3	84	85·7
	34	..	94	..	97	..	7	..	69	..	86	..
	..	*1·1*	..	*1·1*	..	*0·4*	..	..	..	*4·5*	..	±2·2
	..	*19·6*	..	*85·8*	..	*93·1*	..	*0*	..	*35·9*	..	*72*
	5	..	78	..	94	..	0	..	14	..	44	..
	4	4·7	78	77·3	93	94·0	0	0	8	11	34	39·3
133°	5	..	76	..	95	..	0	..	11	..	40	..
	..	*1·1*	..	*5·4*	..	*2·1*	..	..	..	*1·3*	..	±2·2
	..	*3·3*	..	*50·2*	..	*83·1*	..	*0*	..	*3·5*	..	*17·3*
	0	..	7	..	40	..	0	..	0	..	0	..
	0	0	11	7·7	43	40·3	0	0	0	0	2	0·7
135°	0	..	5	..	38	..	0	..	0	..	0	..
	..	..	..	±2·3	..	±2·9	..	..	..	..	..	..
	..	*0*	..	*14·2*	..	*56·9*	..	*0*	..	*0*	..	*0*
	0	..	0	..	1	..	..	..	..	..	..	..
	0	0	0	0	3	1·7	..	..	..	..	..	..
137°	0	..	0	..	1	..	..	..	..	..	..	..
	..	..	..	±0·7	..	±2·1	..	..	..	..	..	..
	..	*0*	..	*2·4*	..	*31·1*	..	..	..	..	..	..

NOTE.—The figures in italics are extracted from Table 4. Those in the left-hand columns are the means of the ten-minute dips; those in the right-hand columns are the means of the five-minute dips. In both cases the seed has been presoaked five to six hours at 63°.

germination are greater with the 84° presoak, except in the case of the five-minute dip at 135° and 137°, where there is a reversal in favour of the 63° presoak. Consultation of Table 4 will show that the high germination at 135° and 137° of the 63° presoak is due to the abnormally high result from one group of three samples, so that, on the whole—at least up to the point where germination becomes seriously affected—a presoak temperature of 84° is less injurious to the vitality of the seed than is a presoak temperature of 63° when the germination is commenced on the day following the treatment.

(2.) *Dipping.*

The effect of dipping or treatment proper on the seed, as regards the factors of duration and temperature of the dip, is set out in Table 4, and illustrated in Figs. 1 and 2. Fig. 1 shows graphically the total germinations given in Table 4. With a presoak of five to six hours at 63° no reduction is caused up to ten minutes at 127° or five minutes at 129°. At 129° and 131° respectively there is a reduction of 3 to 4 per cent., and beyond these points the fall is extremely rapid. The speed and vigour of germination, however, are adversely affected by all the dips in direct proportion to their time and temperature. The strength is illustrated by the photograph, Fig. 2, taken after six days' germination of similar samples—the stronger quite untreated, the weaker presoaked six hours at 84°, and dipped ten minutes at 127°. Both had an actual germination of 98 per cent. when the photograph was taken.

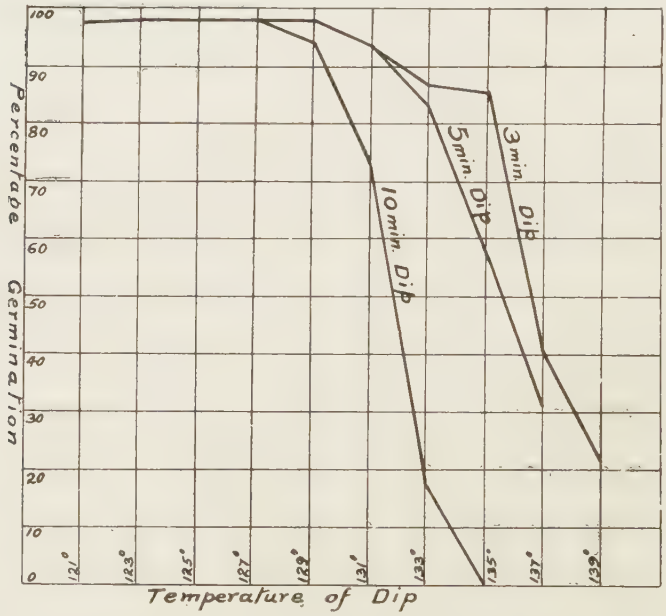


FIG. 1. SHOWING GRAPHICALLY THE TOTAL GERMINATIONS GIVEN IN TABLE 4.

Table 4. Showing the Effect of Dipping on the Seed as regards Duration and Temperature of Dip.
(Seed presoaked five to six hours at 63°.)

Temperature ..	121°.			123°.			125°.			127°.			129°.		
Counts in Days ..	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.
3-min. dip	..	..	..	70	99	100	53	94	97	34	97	98	20	97	98
	..	..	..	69	96	97	42	97	99	44	98	98	26	97	98
	..	..	..	66	96	97	56	100	100	32	97	98	25	96	97
	..	..	..	86	98	99	80	92	95	63	94	96	38	95	97
	..	..	..	84	97	98	80	97	98	60	95	98	38	90	96
	..	..	..	81	96	98	76	96	98	63	94	96	35	90	95
	..	..	..	91	99	100	81	96	97	61	97	98	40	98	99
5-min. dip	..	..	..	90	99	99	81	95	98	62	98	99	36	98	99
	..	..	..	87	98	99	81	98	98	61	96	98	43	100	100
	..	..	..	43	98	98	56	99	99	19	98	98	14	95	99
	..	..	..	42	97	98	38	98	98	15	96	98	10	93	97
	..	..	..	54	100	100	48	99	100	15	95	95	10	92	94
	..	..	..	46	98	100	44	100	100	17	94	98	13	92	97
	27	93	95	19	98	100	14	92	99	5	92	96	0	76	93
	32	93	95	25	97	98	13	98	100	10	92	97	0	77	94
	35	98	98	52	99	100	29	95	97	28	98	100	2	91	97
	37	98	98	34	96	97	28	99	99	29	100	100	0	87	95
10-min. dip*	46	99	99	46	99	99	25	95	96	14	97	98	0	75	92
	56	95	97	57	99	99	18	97	98	7	87	94	0	78	91
	82	95	96	94	98	99	65	93	98	69	95	99	19	77	95
	89	94	98	88	95	96	74	94	97	52	91	97	9	61	96
	30	96	97	32	98	99	20	97	99	7	96	97	0	65	94
	43	97	98	25	98	100	12	96	99	21	95	98	0	69	95

Means of above Results.

3-min. dip ..	..	..	..	68·3	97	98	50·3	97	98·6	36·6	97·3	98	23·6	96·6	97·6
5-min. dip	..	..	..	±4·5	±0·2	±0·2	±3·8	±0·5	±0·3	±5	±0·3	±0·3	±3	±0·7	±0·4
	..	..	..	70·4	98	98·9	66·5	97	98·1	43·6	95·7	97·4	27·7	94·3	97·3
10-min. dip	±4·6	±0·4	±0·3	±5·6	±0·3	±0·3	±4·6	±0·4	±0·2	±4·5	±0·8	±0·4	±1·2	±1·9	±0·4
	47·7	95·8	97·1	47·2	97·7	98·7	29·8	95·6	98·2	24·2	94·3	97·6	3	75·6	94·2

* These figures are extracted from the results of the duration of storage tests up to thirty-one days given in Table 6. Though not strictly comparable with the other results in the table, on which germination was commenced on the day following treatment, yet, since the delay had no appreciable effect, they have a distinct comparative value.

Table 4. Showing the Effect of Dipping on the Seed as regards Duration and Temperature of Dip—continued.

(Seed presoaked five to six hours at 63°.)

Temperature ..	131°.			133°.			135°.			137°.			139°.		
Counts in Days ..	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.
3-min. dip	3	86	96	0	56	87	0	33	87	0	7	39	0	0	23
	6	83	92	0	56	87	0	39	83	0	7	42	0	0	23
	10	86	93	0	61	85	0	42	86	0	4	40	0	0	18
	47	93	95	13	78	90	0	31	79	0	8	44	..	..	..
	44	93	97	8	65	90	0	30	71	0	8	47	..	..	..
	42	89	94	12	68	90	0	29	74	0	4	45	..	..	..
5-min. dip	21	89	94	0	69	94	0	8	56	0	1	25	..	..	..
	23	91	93	0	68	87	0	9	53	0	0	30	..	..	..
	19	87	93	0	70	91	0	12	60	0	2	27	..	..	..
	0	83	94	0	20	77	0	7	43	0	0	22	..	..	..
	0	74	92	0	22	67	0	5	44	0	1	23	..	..	..
	0	82	91	0	21	74	0	5	43	0	0	21	..	..	..
	0	77	88	0	21	71	0	6	46	0	0	27	..	..	..
	0	30	80	0	0	19	0	0	0	..	..	..	..	..	..
	0	30	79	0	0	17	0	0	0	..	..	..	..	..	..
	0	17	53	0	4	15	0	0	0	..	..	..	..	..	..
	0	20	62	0	0	12	0	0	0	..	..	..	..	..	..
10-min. dip*	0	70	75	0	11	31	0	0	0	..	..	..	..	..	..
	0	78	89	0	18	39	0	0	0	..	..	..	..	..	..
	0	26	75	0	0	5	0	0	0	..	..	..	..	..	..
	0	22	68	0	2	15	0	0	0	..	..	..	..	..	..
	0	29	63	0	0	5	0	0	0	..	..	..	..	..	..
	0	36	76	0	0	15	0	0	0	..	..	..	..	..	..
Means of above Results.															
3-min. dip ..	6·3	85	93·6	0	57·6	86·3	0	38	85	0	6	40·3	0	0	21·3
5-min. dip	±4·1	±1·4	±0·5	±1·1	±5·4	±2·1	..	±2·3	±2·9	..	±0·7	±2·1	..	..	..
	19·6	85·8	93·1	3·3	50·2	83·1	0	14·2	56·9	0	2·4	31·1	..	..	..
10-min. dip	..	±4·5	±2·2	..	±1·3	±2·2	..	..	..	..	..	..	..	..	..
	0	35·9	72	0	3·5	17·3	0	0	0	..	..	..	..	..	..

* These figures are extracted from the results of the duration of storage tests up to thirty-one days given in Table 6. Though not strictly comparable with the other results in the table, on which germination was commenced on the day following treatment, yet, since the delay had no appreciable effect, they have a distinct comparative value.

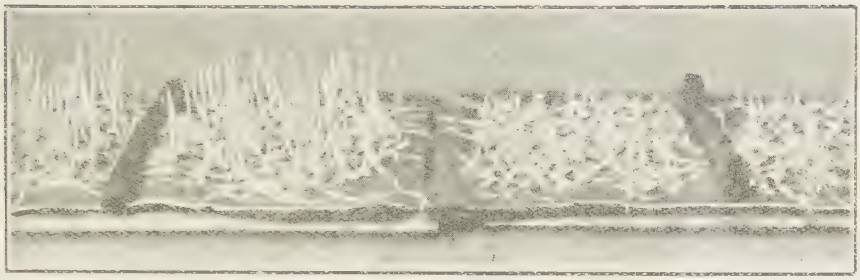


FIG. 2. SIX-DAY GERMINATION OF TWO SIMILAR SAMPLES OF SEED.

To left, untreated; to right, presoaked six hours at 84° F. and dipped ten minutes at 127°. Both samples had an actual germination of 98 per cent.

[*Photo by H. Drake.*

(3.) *Drying.*

Experiments in drying or after-treatment of the seed, as regards rapidity and temperature, are presented in Tables 5 and 6.

Table 5.

(Seed presoaked six hours at 63°, and not dipped.)

Germination commenced / Period of Count in Days	Without Drying.			Spread out Overnight.			Six Hours in Air-current at 95°–100°.		
	3.	6.	9.	3.	6.	9.	3.	6.	9.
	95	97	97	98	99	99	55	99	99
	97	98	99	95	97	97	57	93	95
	98	100	100	94	97	97	54	97	98
	96	99	99	95	97	97	77	98	99
	97	99	99	97	98	98	86	99	99
Mean	96·6	98·6	98·8	95·8	97·6	97·6	65·8	97·2	98·0

Under the conditions of the experiment set out in Table 5 (seed presoaked six hours and not dipped) the samples which were put to germinate at once without any drying came away rapidly and gave a high total germination. The samples which were left spread out and exposed to the air of the laboratory overnight came away almost as well, but did not give quite so high a total germination. The ungerminated seeds of these latter samples almost all showed a growth of *Penicillium* and *Rhizopus* moulds. The samples dried for six hours in an air-current at 95° to 100° showed a considerable delay in commencing germination, but, with the exception of one sample, gave as high a total germination as the samples which were not dried or as the entirely untreated seed. In the sample mentioned, of the five ungerminated seeds remaining after the nine-day count, three showed a strong growth of *Penicillium* sp. A great deal more work must be done on methods of drying before any reliable generalizations can be made.

Table 6. Showing Effect on Seed of Period of Storage after Treatment.

Interval between Treatment and Commencement of Germination	1 Day.			7 Days.			14 Days.			21 Days.			31 Days.			62 Days.			93 Days.		
Counts in Days	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.	3.	6.	9.
Presoaked but not dipped	65	97	97	79	97	97	88	96	96	88	93	93	75	97	97	62	99	100	57	99	100
	65	97	97	84	97	97	94	99	99	97	99	99	80	99	99	52	96	96	59	97	97
Dipped 10 min. at 121° ..	27	93	95	35	98	98	46	99	99	82	95	96	30	96	97	20	99	99	19	94	98
	32	93	95	37	98	98	56	95	97	89	94	98	43	97	98	20	100	100	20	95	98
,, 123° ..	19	98	100	52	99	100	46	99	99	94	98	99	32	98	99	9	96	98	0	91	98
	25	97	98	34	96	97	57	99	99	88	95	96	25	98	100	11	98	100	0	90	97
,, 125° ..	14	92	99	29	95	97	25	95	96	65	93	98	20	97	99	6	90	98	0	91	97
	13	98	100	28	99	99	18	97	98	74	94	97	12	96	99	8	94	97	0	94	99
,, 127° ..	5	92	96	28	98	100	14	97	98	69	95	99	7	96	97	3	85	97	0	95	100
	10	92	97	29	100	100	7	87	94	52	91	97	21	95	98	12	91	94	0	81	98
,, 129 ..	0	76	93	2	91	97	0	75	92	19	77	95	0	65	94	0	57	86	0	60	97
	0	77	94	0	87	95	0	78	91	9	61	96	0	69	95	0	65	91	0	63	96
,, 131° ..	0	30	80	0	17	53	0	70	75	1	26	75	0	29	63	0	15	63	0	17	67
	0	30	79	0	20	62	0	79	89	0	22	68	0	36	76	0	12	57	0	12	62
,, 133° ..	0	0	19	0	4	15	0	11	31	0	0	5	0	0	5	0	0	9	0	0	2
	0	0	17	0	0	12	0	18	39	0	2	15	0	0	15	0	0	11	0	0	3
,, 135° ..	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mean of 9-day counts ..	75·3			73·1			77·4			73·7			73·9			72			72·7		

The whole of the samples shown in Table 6 were treated in bulk on 8th May, dried in air-current at 95° to 100° for six hours, then counted out and stored in paper packets in the laboratory. It appears from the tabulated results that the vitality of this line of seed is not appreciably affected by storage after presoaking, dipping, and drying —at any rate up to a month.

ANOTHER METHOD.

One other method of hot-water treatment—namely, a dip of twelve hours at 104°, without presoak, and dried four hours in air-current at 100° to 105°—was tried on 300 seeds, the results on germination being as follows:—

Three-day count = 74, 78, 84: mean = 75·3.
Six-day count = 94, 93, 95: mean = 94·0.
Nine-day count = 96, 95, 95: mean = 95·3.

SUMMARY.

(1.) Presoaking in itself does not appear to injure the vitality of the seed, but renders it more sensitive to the action of the higher temperatures in the subsequent dip.

(2.) There is a slight advantage in a presoak temperature of 84° over a temperature of 63° for five to six hours when germination is commenced on the day following treatment.

(3.) With a presoak of five to six hours at 63° the total germination is unaffected by a subsequent dip of ten minutes up to 127°, or five minutes up to 129°. A reduction of 3 to 4 per cent. takes place in each case by a further rise of 2°, and a rapid reduction with a still further rise.

(4.) The germination speed is in all cases lowered in direct proportion to increase in both time and temperature of dip.

(5.) Drying quickly, following treatment, in an air-current at 95° to 100° has no injurious effect on germination, nor, when treated seeds are thus dried, is there any loss of vitality after storage up to one month.

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MARTON EXPERIMENTAL AREA.

NOTES ON OPERATIONS, SEASON 1923–24.

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THE 1923–24 season in the Marton district was one of the poorest cropping seasons, so far as weather is concerned, that has been experienced for many years, and this was fully reflected in the poor grain-yields recorded all over the district. In the autumn of 1923 very wet weather set in, and these conditions continued right through the winter and well into the spring. This was followed by an excessively dry spell in November and December. Owing to the wet conditions very little autumn or winter ploughing could be done. It was September before much spring ploughing could be carried out, and the land, through lying wet and sodden all the winter, turned up in very bad condition, being particularly bad on areas where natural fodder crops had been fed off. The dry weather following suddenly on the wet conditions caused the land to dry quickly into hard lumps; consequently it was impossible in many instances to prepare a satisfactory seed-bed. Wet conditions set in again early in the New Year, but, although this was bad for harvesting, the extra growth of grass went a long way towards compensating for poor root and grain crops.

CROPS.

A much larger portion of the Marton Experimental Area than usual is now in pasture for the purpose of building up fertility and conducting various top-dressing experiments; consequently the area under crops in the past season was smaller than for some years past. It consisted of 7 acres of Algerian oats, 2½ acres of wheat, 2¼ acres of Black Skinless barley, 4 acres of vetches, 2 acres of peas, and 2 acres of swedes—a total of 19¾ acres. In addition, 1 acre of genuine imported wild white clover and ⅛ acre of Phalaris bulbosa were sown.

Cereals.—The oat crop was patchy, parts being badly affected with red-leaf. The crop was sown on 17th September with 2 cwt. of 36-38 per cent. super per acre, and harvested on 8th January, yielding 1½ tons of good-quality chaff per acre. The wheat consisted of half Major and half Marquis, and, being only a small area, suffered badly from birds. The crops were sown on 18th September with 2 cwt. super per acre; they ripened evenly, and were harvested on 19th January. Marquis threshed 26⅔ bushels and Major 20 bushels of milling-grain per acre. The Black barley was sown on 9th October at the rate of 2½ bushels, with half Nauru phosphate and half super at 2 cwt., per acre. It was rather a wet piece of land, but the barley grew fairly well, and was harvested on 10th January and yielded 28½ bushels per acre.

Peas.—The 2 acres of Early Minto peas were sown on 9th October at the rate of 3 bushels, with 1 cwt. Nauru phosphate and 1 cwt. super, per acre. The peas germinated well and made splendid growth. They were cut on 29th January; conditions were not very good for harvesting, and a great many were shaken out on the ground during the process of saving. The threshed yield was 27⅔ bushels per acre.

Vetches.—These consisted of 2 acres each of Golden and Grey, which were sown on the same date as the peas, at the rate of 2½ bushels per acre. They grew well and promised a heavy crop, but owing to bad weather at harvest fully half the crop was lost. The yields were—Golden, 14⅛ bushels, and Grey, 11⅛ bushels, per acre.

Swedes.—Two acres of land adjoining the experimental area were acquired late in the season, and this was ploughed at once and sown in five varieties of swedes as a disease-resistance test. Owing to the late ploughing and dry spring none of the varieties gave a heavy crop. No club-root was found, but four out of the five varieties were affected with dry-rot to the extent of 7 per cent., the exception being Vilmorin's White-fleshed Purple-top, which appeared quite free. Following were the yields of roots per acre: Vilmorin's White-fleshed Purple-top, 21 tons 10 cwt.; Irvine's Purple-top, 11 tons 17 cwt.; Bangholm Purple-top, 11 tons 8 cwt.; Sutton's Hardy White (white-fleshed), 11 tons 5 cwt.; Nimmo and Blair's Royal Purple, 10 tons 8 cwt. The Vilmorin roots forked badly and looked rough, but were very palatable, and produced practically double the feeding of any of the other varieties.

Wild White Clover.—This was sown on 1st November, and came away slowly, but has now covered the ground nicely. It is too soon to hazard an opinion as to how it will compare with colonial wild white.

Phalaris bulbosa.—The seed was sown in the autumn, and it appears to have germinated well. It is proposed to grow this for a seed crop.

PASTURES.

An 11-acre field of temporary pasture closed in October for hay purposes was found later to be carrying a fair crop of rye-grass, and it was decided to cut it for seed. The crop was harvested with a reaper-and-binder on 3rd January, stooked straight away, and threshed from the stook on 11th January, yielding 19 bushels of seed per acre. The field was sown on 26th April, 1921, and top-dressed with various manures during the first week of August the same year. Prior to the crops being cut in the 1922–23 and 1923–24 seasons, weighings of the green material were taken, and resulted as follows:—

	1922–23.		1923–24.		Total.	
	Tons	cwt.	Tons	cwt.	Tons	cwt.
Basic slag, 3 cwt.	12	9	6	8	18	17
Nauru phosphate, 3 cwt.	10	11	6	19	17	10
50 per cent. phosphate, 3 cwt.	10	11	6	16	17	7
Control (no manure)	10	11	6	5	16	6

These weighings represent a growth of about seventy days each year—October to December. The lighter weighing in 1923 24 is partly accounted for by the late growth of clover; the clover came away after the rye-grass had been removed, and produced a wonderful aftermath. This field, in addition to producing the cut of grass-seed, carried an average of 3·75 sheep per acre for the whole year, and would easily have carried five sheep had they always been available when required.

Five acres of temporary pasture sown in 1918, and cut each year since for hay, was again shut up on 11th October, and cut and weighed on 4th December. As mentioned in last year's notes, this area was divided up and some top-dressing done in 1922 at the rate of 2 cwt. per acre, with the exception of plot 4, which was top-dressed with 2 cwt. super per acre in 1921 and again in 1923. The following table gives the results in green material of the 1922 and 1923 weighings :—

Plot.	Top-dressing.	1922.		1923.		Total.	
		Tons	cwt.	Tons	cwt.	Tons	cwt.
1	Super, 2 cwt.	9	0	5	7	14	7
2	Control (no manure)	7	14	4	17	12	11
3	Super, 2 cwt.	9	0	5	2	14	2
4	Super, 2 cwt., 1921 and 1923 ..	8	7	6	6	14	13
5	Nauru phosphate, 2 cwt.	7	11	5	15	13	6
6	Control (no manure)	7	14	5	6	13	0
7	Nauru phosphate	7	11	5	9	13	0

It will be noticed that the super plots gave an average of 1 ton per acre over the Nauru phosphate, and the superiority of the super could be seen throughout the year. A further area of 13½ acres has been sown in temporary pasture, and this will be used for top-dressing experiments during the 1924–25 season.

LUCERNE.

The lucerne was again cut three times, a fourth cut being wasted owing to bad weather. As shown in the next table, this stand continues to give satisfactory results, particularly in view of the fact that the Marton Area is not considered suitable for lucerne, and that owing to the stiff nature of the land it has not been possible to cultivate the stand during the past four years.

Season.	Sown broadcast.		Sown in 7 in. Drills.		Sown in 14 in. Drills.		Sown in 21 in. Drills.	
	Tons	cwt.	Tons	cwt.	Tons	cwt.	Tons	cwt.
1920–21 (three cuts)	17	0	17	5	17	0	14	14
1921–22 (four cuts)	25	10	19	14	22	12	21	8
1922–23 (three cuts)	18	15	17	13	18	4	16	12
1923–24 (three cuts)	15	15	14	17	14	4	13	6
Average for four seasons ..	19	5	17	7	18	0	16	10

A small area of lucerne sown in 1919 in this field was divided, and one-half top-dressed with super at the rate of 2 cwt. per acre, the other half being left as a control. Subsequent cuttings gave a return of 1 ton 18 cwt. from the manured area and 19 cwt. from the unmanured area.

GENERAL.

In addition to producing the above-recorded crops, plus 14 tons of pressed hay, the whole experimental area carried an average of 1·78 sheep per acre for the year, and would easily have carried three per acre had the sheep been available when required.

VARIATIONS IN THE PERCENTAGE OF BUTTERFAT IN MILK.

A STUDY BASED ON NEW ZEALAND C.O.R. DATA.

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THE percentage butterfat content of milk, more commonly known as the "test" or "milk-test," is a very useful number to dairymen. It supplies the key to the total amount of butterfat contained in milk, provided, of course, that the weight of milk is known. With the aid of modern testing-appliances the butterfat test of milk is such a simple operation, and the system so reliable, that the work can well be done by the farmer himself or even by school-children. The dairy-farmer who owns a testing outfit, and who uses it regularly, is supplying himself with valuable information. Not only is he recording the production of his cows, but also he is educating himself in regard to the better understanding of the peculiarities of each cow and the better management of the herd, besides acquiring important knowledge necessary to good breeding-practice. Most dairy-factory concerns pay the supplier on the basis of the butterfat content of milk, and for that reason the test is always of much concern to the factory supplier. In the supply of milk for human consumption the producer is rarely paid for quality, and his chief concern is maximum production of milk, provided the percentage of butterfat content does not fall below the minimum required by the law. But even in this branch of the dairy industry there seems to be a tendency to payment on the quality basis of milk, and, if this were to become popular, dairymen would require to use tests more than previously. It will thus be seen that the butterfat percentage of milk is an essential factor in practically all branches of the dairy industry.

1. GENERAL VARIATIONS.

BREED AND INDIVIDUALITY OF COWS WITHIN EACH BREED.

It is a well-known fact that the average percentage of butterfat in milk varies with the breed of cattle, but can it be said that the test is constant for each breed? It is possible that the average tests of a breed may vary with the country of location, with the particular type bred for in a country, and with the climate. Unfortunately, the average tests for the various dairy breeds in other countries are rarely published, and thus, through lack of data, it is difficult to investigate these points. From what is known, however, it appears that the average test for each breed varies very little for different countries, and that the test is fairly constant for each breed. It is thought quite likely that small differences would show themselves if the same breed were bred for quality of production in one country and quantity of production in another. Differences in climatic conditions would hardly show any effect, because almost all dairy cattle are protected from extremes of temperature when necessary, and receive attention accordingly.

The average tests obtained in New Zealand from all the first-class certificates of record of the various breeds from 1913 up to 31st December, 1923, are as follows :—

Table 1.

Breed.	Average Test.	Number of Records.
Jersey	5·55	2,391
Red Poll	4·39	34
Ayrshire	4·11	113
Milking Shorthorn	3·97	263
Shorthorn	3·90	6
Friesian	3·54	1,042

The difference in the average tests of the Jersey and Friesian breeds is quite marked, while for the other four breeds the differences are smaller. If more breeds were represented it would probably be found that no two breeds test quite the same.

The reason that the average tests are constant within small limits for each breed is no doubt due to heredity, since it seems to be well recognized that the quality of milk is hereditable ; but when one comes to study the yearly tests of individuals within a breed, it is found these vary widely, as the following tabulation of our C.O.R. data will show :—

Table 2.

Breed.	Average Yearly Test.	Highest Yearly Test.	Lowest Yearly Test.
Jersey	5·55	7·65	3·85
Ayrshire	4·11	5·25	3·29
Milking Shorthorn	3·97	5·60	3·16
Friesian	3·54	4·89	2·74

The highest Jersey and the lowest Friesian tests of these averages could hardly be reconciled as belonging to cows of the other two breeds, but the lowest Jersey and the highest Friesian tests could each be credited as belonging to an Ayrshire or to a Shorthorn. The highest Ayrshire and Shorthorn tests could be mistaken for Jersey tests, and the lowest Ayrshire, Jersey, and Shorthorn tests for Friesian tests. From this it is patent that variation due to individuality is considerable, and that it would be a difficult matter to name the breed of cow for some individual tests. In order to compare the range of variation of tests for the four chief breeds the following table has been prepared :—

Table 3.

Breed.	Percentage of Highest Test above Average Test.	Percentage of Lowest Test below Average Test.	Percentage Total Range of Variation.
Milking Shorthorn	41	20	61
Friesian	38	23	61
Ayrshire	28	20	48
Jersey	38	31	68

Thus it is seen that the average total range of variation is about 60 per cent. of the average test for a breed.

Seeing that the tests within a breed vary so much, the breeder is afforded good scope to breed for quality by selection. In order to present at a glance over what range yearly tests vary within each breed the accompanying graphs were prepared. They clearly indicate how wide this variation is, the variations being mainly due, of course, to the individuality of the cow. It is interesting to note that the test corresponding with the largest group does not coincide with the average test for the breed. Nevertheless it will be observed that the average test lies about midway among the largest groups. In the case of the Milking Shorthorns the maximum group is the one which lies between 3·8 and 3·89, while the average tests of the breed lies in the next group, 3·9–3·99. Seventy-eight per cent. of the Milking Shorthorn tests lie between 3·5 and 4·29. The biggest groups in the Ayrshires are those of 4·0–4·09, 3·9–3·99, and 3·8–3·89, each having thirteen tests. The average test of the breed lies between 4·1 and 4·19, this being the next largest group, with twelve tests. Seventy-six per cent. of the Ayrshire tests lie between 3·5 and 4·29. It is remarkable that the percentages quoted above for the Milking Shorthorns and Ayrshires, and for the same limits, should be almost identical, although there is a difference in the average tests of 0·14. The average test of the Friesian breed is 3·54, while the largest group is one lower than this — namely, 3·4–3·49. Seventy-seven per cent. of the Friesian tests are between 3·1 and 3·89. Here again it is seen that the percentage is practically the same as with the other two breeds, the range of the limits being 0·8, as in the other cases.

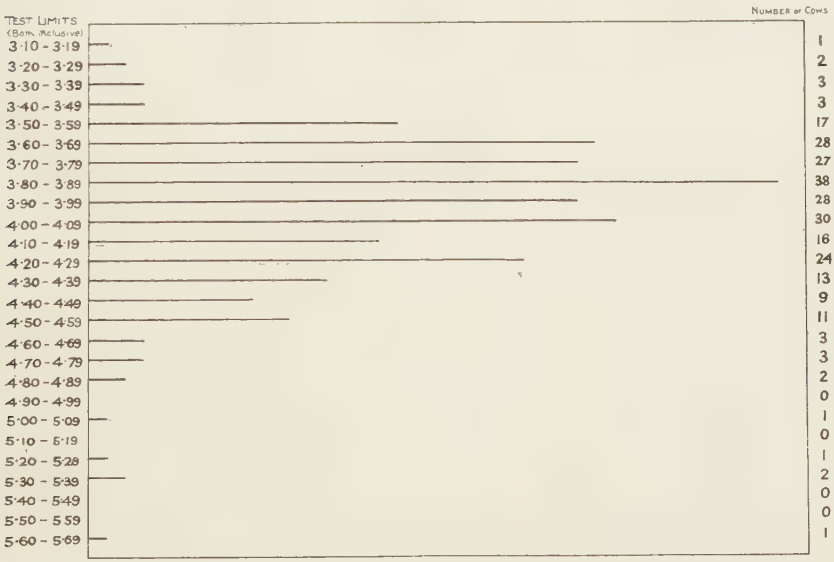

FIG. 1. SHOWING GRAPHICALLY THE RESULT OF ANALYSIS OF ALL YEARLY TESTS OF MILKING SHORTHORN COWS UNDER THE NEW ZEALAND C.O.R. SYSTEM.

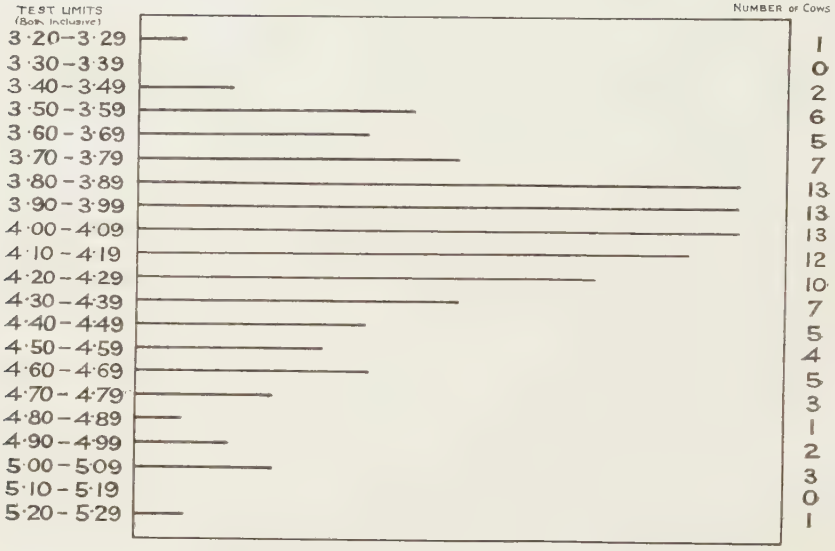

FIG. 2. ANALYSIS OF ALL YEARLY TESTS OF AYRSHIRE COWS.

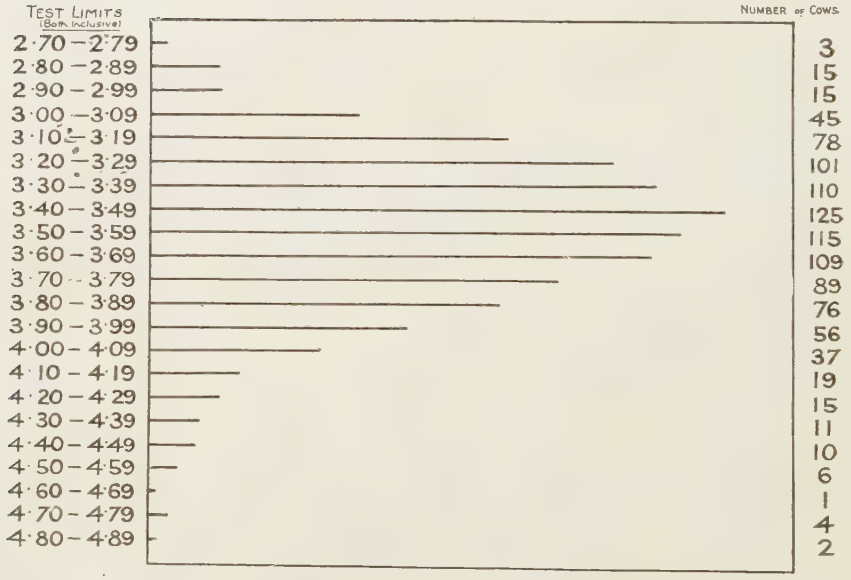

FIG. 3. ANALYSIS OF ALL YEARLY TESTS OF FRIESIAN COWS

RELATION OF QUANTITY AND QUALITY OF MILK.

When a breeder breeds to raise the test, does he attain quality at a sacrifice to quantity of milk-production? This is a question of vital importance to breeders, and to investigate the point it must not be overlooked that in analysing data to probe the problem only records for cows of the one breed and age should be compared. The two largest groups available are the two-year-olds of the Jersey and the Friesian breeds, and the tests have been analysed as in the three preceding graphs, and these subdivided again according to the quantity of the milk-production. The following two tables show the results obtained :—

Table 4.—Analysis of Two-year-old Friesian Tests according to Quantity of Milk-production.

Milk-production.	Percentage of Tests below 3·4.	Percentage of Tests 3·8 and above.	Average Test.	Number of Tests.
lb.				
6,000	0	63	3·96	16
7,000	3	45	3·77	33
8,000	21	19	3·62	53
9,000	29	30	3·62	56
10,000	36	25	3·55	53
11,000	36	23	3·52	53
12,000	33	15	3·55	40
13,000	40	14	3·46	42
14,000	33	19	3·54	21
15,000	35	24	3·59	17
16,000	69	6	3·28	16
17,000 and over	38	8	3·48	13

Table 5.—Analysis of Two-year-old Jersey Tests according to Quantity of Milk-production.

Milk-production.	Percentage of Tests below 5·0.	Percentage of Tests 6·0 and above.	Average Test.	Number of Tests.
lb.				
3,000	0	100	6·64	9
4,000	3	31	5·82	103
5,000	11	27	5·64	280
6,000	15	24	5·59	274
7,000	11	23	5·63	246
8,000	24	19	5·53	140
9,000 and over	23	13	5·42	102

Although the variations for the second and third columns of these tables do not progress quite uniformly in the lower half of each table, especially for the Friesians, it will be noticed that the higher the milk-production groups are taken the more the percentage of low tests increases and of high tests decreases. This seems to indicate that the quality of milk is raised at the expense of quantity. When the average tests are taken group by group it is found that for the first few groups the test does decrease uniformly, but for subsequent groups does not appreciably vary. Of course, it must be borne in mind that all cows were not under the same conditions in regard to quantity and variety of feed, and general care and treatment. It is a well-known fact that if a cow

is neglected late in her lactation period, or is due to calve early, she will soon dry off, and that the tests rise more or less steeply according to the rapidity of decrease in milk-flow. In other cases where a cow's milk-production is kept up as much as possible to the close of her lactation period, or she is due to calve late, the test does not rise as rapidly. Such cases affect the average yearly test, and the following table bears this out to a certain extent :—

Table 6.—Comparison of the Highest- and Lowest-testing Two-year-olds of the Four Principal Breeds.

Extreme Groups.	Average Number of Days in Milk.	Average Number of Days Empty after Commencement of Test.	Average Number of Days between Calvings.	Average Production of Milk.	Average Production of Butterfat.	Average Test for Lactation Period.
				lb.	lb.	
Six highest-testing two-year-old Friesians	343	107	386	8,792·0	406·02	4·62
Six lowest-testing two-year-old Friesians	337	123	407	12,695·4	360·13	2·84
Six highest-testing two-year-old Ayrshires	331	83	367	7,053·2	331·33	4·70
Six lowest-testing two-year-old Ayrshires	345	114	397	10,826·4	395·33	3·65
Six highest-testing two-year-old Milking Shorthorns	353	115	395	6,968·1	321·15	4·61
Six lowest-testing two-year-old Milking Shorthorns	355	133	411	10,083·0	364·28	3·61
Six highest-testing two-year-old Jerseys	358	118	402	6,200·9	450·40	7·26
Six lowest-testing two-year-old Jerseys	349	107	388	7,034·3	297·97	4·24

It will be readily noticed that the two-year-old Jersey extreme groups bear out the direct opposite to those of the three other breeds. This may be only a phenomenon occasionally met with in statistics. However, the reason appears to be due to the closeness of equality of the average milk-production, for it will be noticed that for each of the others there is a considerable difference in the average milk-production of the two extremes. The extremes were chosen for the reason that there are so many variables which obscure one another, and it is only when the extremes are compared that the effects of the several variables are better apparent. Apart from heredity, the chief factors which appear to influence the test are the number of days in milk, the number of days empty, and the number of days between calving at commencement of test and subsequent calving. Besides these, the age, time of calving at commencement of test, kind of season experienced, feed, and treatment are all factors which influence the test to some extent. As some of the factors are interdependent, the problem is very complex, and presents many difficulties to the investigator. The number of days in milk does not always tend to influence the test in the one way, for in some cases the owner, for reasons best known to himself, terminates a test before a cow is actually dry, although she might reasonably have continued in milk for perhaps two more months. In such

cases the average yearly test will be lower than normal, for the reason that the higher final monthly tests were not included.

To revert back to Tables 4 and 5, it must be conceded that the largest number of cows represented doubtless received average treatment, and calved about the end of the thirteenth month after test, and thus should have tested normally. It is reasonable to expect all cases to be represented in each group with the exception of the extreme groups. This, then, seems to explain the marked decrease in the tests for the first three groups, but, at the same time, the explanation does not appear to apply so well to the last few groups. The average tests of all two-year-old Friesians and Jerseys are respectively 3·56 and 5·6. Thus it is found that the last eight Friesian groups, except that for 15,000 lb. milk, are below the average, and that the first four are above the average. In the case of the Jerseys, the tests for the first three groups are above, and the last two below, the average. The Jersey tests for groups 9,000, 10,000, 11,000, and 12,000 (not given in the table) are 5·41, 5·46, 5·47, and 5·08 respectively, and thus are below the average test for all two-year-olds. Taking the middle groups in each table—they being the largest numerically—and remembering that these probably represent cows under average conditions, it cannot be said that the test has been materially lowered for higher milk-production.

From this it may be accepted that quality and quantity of milk are independent factors, and that they are separately hereditable. There also seems good reason to believe that the average test for the year is slightly influenced according to the extent to which the milk-production for the year may vary from normal. Combining the two, it seems that a cow inherits capacity for a certain quality and quantity of milk, but that the two may vary during a lactation period according to circumstances.

By selecting good producing animals of high test for breeding purposes the average test as well as the milk-production of a herd may be raised, and it is this which most breeders recognize as their goal.

(To be continued.)

Fowls poisoned by Boxthorn.—The Department's Chemist reports an uncommon case of a number of fowls being fatally poisoned by the leaves of the African boxthorn (*Lycium* sp.) at Wanganui last year. The fowls were confined in a bare run, but got access to the leaves of the shrub through the fence, and ate them as far up as they could reach. The identification of a couple of leaves of this plant in the crop of a fowl led to the detection of the cause of mortality.

Farm-dairy Instruction.—In his annual report for 1923–24 the Director of the Dairy Division remarks: "The work of instruction respecting the milking and care of milk and cream on the dairy farm appears to be growing in popularity. The tendency for dairy-farmers to regard the Farm-dairy Instructor as a friend and helper, rather than as an inspector, is growing to such an extent that dairy-farmers now frequently send for the officer. The farm-dairy instruction work in conjunction with the efficient grading of cream and milk, with differential payments according to quality, is a very effective combination in the interests of improved quality of milk and cream. I expect the farm-dairy instruction work will, if given the necessary encouragement, become general throughout New Zealand."

HANDLING THE WOOL-CLIP FOR SALE.

SHEARING-TIME PRACTICE ON THE FARM.

J. G. COOK, Wool Instructor, Live-stock Division.

THE subdivision of large sheep-stations in New Zealand in earlier years was followed by considerable retrogression as regards trueness to type in sheep, together with less evenness and character in the wool. This was largely owing to a lack of knowledge of sheep-breeding and wool-growing on the part of the smaller settlers. Moreover, large numbers of farmers came to consider that it did not pay to have their wool skirted and classed, with the result that a great proportion of the Dominion's clip reached the market almost in the condition in which it came off the shearing-board. It is encouraging to note, however, that of late much of this lost ground has been recovered. Publicity, lectures, and demonstrations provided by the Department of Agriculture may fairly be claimed to have had a marked effect in this direction. The shearing season of 1923–24 made a record as regards the number of wool-producers who had their clips properly prepared before sale—with handsome ultimate profit to themselves. There is still much to be done, however, and we should not be satisfied until all the fleece-wool shorn in the Dominion is properly skirted and classed. Farmers may (1) do this work themselves, (2) employ a wool-classer, or (3) let their wool-broking firm do it for them. The present article aims at helping the producer to take the first course and become self-reliant in this respect.

THE WOOL-SHED.

The wool-shed should be thoroughly cleaned out a day or two before shearing commences—not merely swept by a broom, but washed out with water and disinfectant. Particular attention should be paid to the parts of the shed the wool actually comes into contact with. On no account must twine, chaff, or rubbish of any kind be left in the wool-bins, wool-press, wool-room, or on the shearing-board ; unless removed such substances are likely to get into the wool and depreciate its value when offered for sale. Sheep-skins should also be kept out of the shed during the shearing-period.

It is essential that there should be a good number of windows or skylights in the wool-shed, so as to admit plenty of light. This applies very strongly to the wool-tables, as it is of urgent necessity that there should be ample light at this part of the shed to enable those who are skirting, lapping, rolling, and classing the wool to do their work comfortably, expeditiously, and without error. In a large number of wool-sheds the light is very poor. Windows by the wool-table should be just about the length of the table.

TABLES AND BINS.

A suitable size of wool-table is 9 ft. long and 4 ft. wide. It will be found very convenient to have the table canted—that is, one side higher than the other—and the higher side against the wall of the shed. The lower side is where the wool-roller is working from, and

when he has done the work on the side of the fleece nearest him he simply reaches across the table and brings the far side of the fleece over to him. Having the table at an angle makes this easier than if the table was level. One often finds the tables made too small, with the result that the fleeces cannot be thrown out straight, which makes good work at the table very difficult, some of the skirtings being apt to be left on the fleece. When the table is a good length and width this greatly facilitates the work of dealing with the wool, more especially if a fast gang of men is on the shearing-board.

It is very handy to have a small table for putting the locks over. A size of 3 ft. 6 in. each way will do. Put ½-in.-mesh wire netting over the top of the frame, then nail a board on each side and allow the top edge of the boards to come 4 in. above the wire netting. When the locks are placed on the table and shaken the rubbish falls through the netting, and dags and large pieces of wool can be readily picked out and each lot put in its place.

A very convenient size for the wool-bins (fleece and pieces) is 3 ft. wide, 4 ft. 6 in. to 5 ft. deep, and 7 ft. high, which will hold about one and a quarter bales of wool. The width will allow three large fleeces in each row, or, when the fleeces are smaller, four will go in each row nicely for handling when pressing. Pieces or belly-wool can be thrown into their respective bins and tramped occasionally, but each class must be kept in separate bins.

THE FLEECE-PICKER'S DUTIES.

After having shorn the belly-wool off the sheep the shearer should detach it from the fleece and throw it back on the shearing-board convenient for the fleece-picker to pick it up and examine it. If off male sheep the centre will be found stained with urine, and this part must be taken out at once by hand and put into a basket or sack. It is convenient for this purpose to have a sack hung in the corner of the catching-pen, with the mouth of the sack open. These stained pieces must be dried outside in the open air before being pressed. After detaching the stained piece from the belly-wool the latter should be thrown into a bin allotted for that class.

When the shearer has finished shearing the sheep and let it go it will be found in nearly every case that the length of the fleece is lying across the shearing-board, the neck part being nearest the catching-pen wall and the hind quarters nearest the counting-out pen door. The fleece-picker will with his feet push the neck towards the britch of the fleece until he is in a convenient position, when, bending down and reaching forward at the same time, with his hands he catches hold of a hind quarter in each hand; then by making a half-circular movement with his hands away from each other he gathers the rest of the fleece between his hands, picking the fleece up and carrying it to the wool-table. Arriving there he turns the back of his hands upwards, and, making a throwing-forward movement, he releases the part of the fleece which he has between his hands, but retains hold of the part which he has in each hand. In this manner the fleece is thrown nice and straight on the table for the wool-rollers.

The fleece-picker will then return up the board and sweep the part of the floor from whence he removed the fleece, as there are always a

few trimmings and second cuts to be removed before the shearer brings out another sheep from the catching-pen. In sheds where there is a large number of shearers the fleece-picker will find it convenient to pick the fleece up in the manner just described, put it down against the catching-pen wall, get hold of the broom, and sweep the stand clean. Having done this, he can then carry the fleece to the wool-table, and throw it in the manner previously described. He should see that his board is kept clean, taking all large pieces of wool or dags out of the sweepings and putting each class into the place allotted for it.

The fleece-picker will also put Stockholm tar or sulphur (whichever is provided for the purpose by the owner of the shed) on any cut on the sheep when the shearer calls for it. On no account is coal-tar to be used, as it goes hard, and will not scour out when the wool is being scoured ; it also damages the machines in the woollen-mills if it has not been taken out beforehand.

Black fleeces should not be thrown upon the wool-table. Before the shearer brings a black sheep upon the board his stand must be swept clean of all white wool, and in shearing the animal he should leave the belly-wool attached to the fleece. As soon as the sheep is shorn the fleece-picker should roll up the fleece with all the locks and belly-wool, and put it away where it will not come in contact with the white wool. The board should also be swept again.

SKIRTING, LAPPING, AND ROLLING.

As soon as the fleece is thrown out on the table it is ready to be skirted. This is the critical stage of preparation for market when sold in the grease. Skirting consists in removing by hand from the fleece any outer edges which do not harmonize with the rest of the fleece. The following method is recommended : Starting at the britch, remove any part which is stained either by excreta or urine, going right across this part of the fleece. In some fleeces (mostly in crossbred flocks) the lower parts of the britch are inclined to run somewhat hairy, more especially down to the hind legs—the cause usually being carelessness in breeding. This hairy piece should be removed and put in with the pieces. Having detached these parts, throw them into a basket, which should be handy to the table for that purpose. Then work along the side of the fleece nearest, removing any dirty pieces with the one hand, and as you skirt this side turn the fleece in one-third its own width with the other hand. Now you come up to the arm-pit of the fleece, and this part should be watched carefully, as it is just here that the skirtings are the dirtiest, this being partly due to the action of the fore leg, and to the sheep when lying down always having this part in direct contact with the earth. Another cause is the action of the heart generating increased heat and perspiration in that part of the body. Now pass along up to the neck and cheek pieces, which must be removed. As a rule one finds that this wool is inclined to be somewhat knobby or clubby at the tip, and it should be kept separate from the skirtings along the sides of the fleece. Now turn the neck part of the fleece back slightly towards the shoulders, and look back on the side you have skirted and turned in. The shorn side being up, one

can see if any skirtings have been missed ; if so, remove them at once. Then reach across the table with both hands, catch hold of the far side of the fleece, and bring it towards you until that edge rests flush with the side nearest you. This way of bringing it over brings the shorn side uppermost. Now go down the last side of the fleece, removing any dirty skirtings ; with the shorn side turned up, one can see at a glance what to take off. Working back from the neck of the fleece to the britch, throw the skirtings into the bin allotted for them, and the fleece, being properly skirted and lapped, is now ready for rolling. Turn the britch in and roll right from it straight out to the other end of the fleece. Fleeces done up in this way do not need tying of any description. This is the simplest, easiest, and quickest way of skirting, lapping, and rolling ; the operator can always see over his work and rectify any errors when skirting, and the fleeces are readily handled afterwards. Do not adopt the practice of rolling the fleece from both ends. Such fleeces when being handled come loose, both ends bulge out, and rolling again is necessitated. Besides, there is always a loss of time when rolling at the table.

Carrying out the practice described, the following lines, which have been removed from the fleece-wool, will result : (1) A pieces—the skirtings taken off on each side of the fleece ; (2) neck-pieces ; (3) stained pieces — wool stained either by excreta or urine ; (4) belly - wool ; (5) locks—the sweepings of the board and small pieces which fall under the wool-table.

In the case of seediness in the wool, if a fleece is only seedy on the outer edges, take off the seedy parts first, putting such pieces into their respective bins. The fleece, then being clean, can be lapped, rolled, and classed into whichever line it harmonizes with. If a fleece is seedy all over, skirt it ; then, after lapping and rolling, class it into the seedy-fleece bin. Wool is termed " seedy " when it is carrying any seed of piripiri (hutiwai), horehound, burr clover, or Bathurst burr, the first-named being the most common and the only really troublesome one in this country.

CLASSING.

In no other work is one more called upon to adapt oneself to circumstances than in wool-classing—according to the clip being handled. Clips vary in every district, but the following notes will be found useful in connection with the classing of fleece-wool :—

" Combing " is a term applied to any wool in which the fibre is long and strong enough to stand the tension of the combing-machine. The best way to test the wool is to take a staple between the thumb and finger of each hand and then draw the staple out tight. If it will stand this tension all such wool can be classed under " combing."

" Clothing " is a term applied to any wool in which the fibre, although long, is tender (has a break in it), or any wool which is too short in length of fibre to be combed. In respect to the tender wool, the break is due mainly to either shortage of feed or disease. If feed-shortage is the cause, then in a small flock the break will be apparent right through the clip ; on a large station it will be apparent in sheep which have been running on the block of country where there has been a decided shortage. When the break occurs in odd

fleeces throughout the clip, it denotes that these sheep have suffered from some disease during the year, at which time the animals will have been off their feed. As regards wool which is too short for combing purposes, this mostly comes off old merino sheep, generally ewes, more especially those running on high, rough country. As a result of the heavy losses which occasionally occur on such country from severe winter conditions, every ewe has to be kept for breeding-up purposes — hence the short wool produced. One is able to tell from the fibre at which period of the year the check in the wool took place. If it was in the autumn the break will be found nearer the tip of the fibre; if during the winter the check shows about half-way down the fibre; if in the spring it is nearer the lower end of the fibre.

"A (or first) combing": This grade comprises the finest, brightest, and cleanest combing-fleeces in the clip. The line should be made broad enough to take in the greater part of the combing-wool.

"B (or second) combing": This takes in the coarser combing-fleeces, heavier in condition and duller-looking than the first combing.

"C combing": This grade applies to a merino clip in which are found a number of fleeces of very fine wool, but having that heavy greasy tip on it. This wool is best kept by itself, as when scoured properly it will realize the same money as the A combing does when scoured; but, owing to the big percentage of loss in scouring, the buyer will not give so much for it in the grease as he does for the A combing.

"Clothing": Fleeces which are clean, but either too short or too tender for combing purposes.

"Dingy": This term covers any fleeces which have been discoloured either by climatic conditions, log-stain, or parasitic pests.

"Sandy": This term covers any fleeces which have sand throughout them. As the sand absorbs the yolk (which is the life of the fibre) instead of the wool doing so, this wool is always found to be tender. It is mostly found on sheep running on very high country.

"Cotted" or "matted": A very wet winter increases the tendency of the wool to be cotted or matted. Another cause is old age. A broken-mouthed ewe may be in lamb, and from within six weeks of and up to lambing-time, owing to the state of her teeth, she is unable to fully supply the demand made upon her both by the undropped lamb and the fleece. It is then that the cotting commences. Ill health is another cause contributing to cotted fleece. These fleeces should be put in a bin by themselves.

"Double fleece": This means any fleeces which have not been shorn for two years or over. In such fleeces only the stained part across the britch should be removed.

"Black fleece": As previously mentioned, this should not be thrown on the table, and must be kept away from the white wool.

MIXED FLOCKS.

Three leading examples of mixed flocks may be given. The first is fairly typical of New Zealand conditions, being a mixed flock of about three thousand sheep, all carrying clean, strong, shafty wool, and consisting of half-breds, three-quarter-breds, crossbreds, and merinos. The majority being half-breds, two classes should be made of that fleece-wool. Into the first wool-bin put the finest and best fleeces, and

after it is pressed brand the bale "A Combing Half-bred." Into the second bin place the coarser and heavier-conditioned fleeces, branding the bale "B Combing Half-bred." Into the third bin put the finest and best of the three-quarter-bred fleeces, branding the bale "A Combing Three-quarter-bred." Into the fourth bin can be placed the coarsest of the three-quarter-bred and the crossbred fleeces, as it will be found they are of about the same spinning-quality; and as there will be only one line of this, brand the bale "Crossbred Combing." The fifth bin will be used for the merino fleeces, and the bale branded "Merino Combing," there being only one line.

Another example, and one that is very common, is Lincoln, Lincoln cross, Romney, and Southdown. There is a wide difference in the spinning-qualities of these wools, ranging from Lincoln (34's to 36's), Lincoln cross (40's), Romney (44's to 46's), and Southdown (54's to 56's), and each of these lines must be kept separate. If there are only a small number of Southdowns it will be to the grower's advantage to let the broker bin them with other Southdown wool.

The third example will be a flock comprising Romney, Romney crossbreds, and Lincoln crossbreds. Here we have three distinct lines, and they must be kept separate from each other. These sheep as a rule grow strong shafty combing-wool, and if the lines are in equal proportion the following should be made: "A combing," which takes in all the finest-fibred and best-conditioned fleeces in the Romney wool; "A combing" in the Romney cross, this also taking in all the coarser fleeces of the Romney; "B line," Romney cross; "A line," Lincoln cross. Any discoloured fleeces in each of these lines can be put into one line; they can be binned at the wool-store. Any cotted fleeces can also be made into one line and similarly binned. If there is only a small clip like the foregoing, then just make three lines, marking them "A Romney," "A Romney cross," and "A Lincoln cross."

Farmers could save a great deal of this cutting-up if they would breed and keep to only one or two lines, thus reducing the number of classes to a minimum and enabling the clip to be put up in larger lines.

Sometimes a grower is puzzled as to why his clothing-wool realizes almost as much as his combing-wool. The cause is that each wool has its own individual buyers. The worsted-manufacturer requires a wool with strength and character—strong so that it will comb, and character to give it elasticity; therefore any weak tender-fibred wool is of no use to him. Another manufacturer may not be so particular, as he can work up any wool which comes under the term of "clothing."

DINGY CLIPS.

In some seasons the whole clip is dingy, and if there is only one line of sheep on the farm two classes should be made of the fleece-wool. One class will embody all the strong fleeces which will stand the tension of the combing-machine; the other class will take in all the weak tender fleeces. Enter the former line as "Dingy combing," and the latter as "Dingy clothing." If the flock is a mixed one and all dingy, keep each line separate from the others and enter it according to whichever it belongs, as follows: "Half-bred dingy," "Crossbred dingy," "Merino dingy," and other lines in the same way.

SEEDY CLIPS.

Sometimes the whole clip is seedy, and if there is only one breed of sheep on the place two classes should be made, one containing the fleeces which are slightly seedy and the other those which are carrying the most seed. The former should be entered in the wool-book as "Slightly seedy," and the latter "Very seedy." In the event of the flock being a mixed one and all the wool seedy, keep each line separate from the others and enter it according to whichever line it belongs, such as "Seedy Romney Marsh," "Seedy Romney cross," "Seedy Lincoln cross," "Seedy Merino," and so on.

On no consideration should seedy wool be packed with clean wool. All lots must be kept separate if full value is to be received for clean lines. "Seedy fleece," "Seedy pieces," "Seedy belly-wool," "Seedy locks," "Seedy stained pieces," respectively, is the best way to mark each line which is carrying seed. Enter it thus in the wool-book; then there is no chance of it being put up for sale with the clean wool and interfering with the prices the latter will realize.

LAMBS' WOOL.

The difficulty usually experienced by the fleece-picker in "gathering" lambs' wool on the shearing-board can be overcome by using a simple contrivance made with two pieces of 4 in. by 1 in. boarding, each 2 ft. long. Having planed all sides to make them smooth, the two boards or battens are connected by tacking on at one end of each a piece of canvas or sacking 18 in. long and 4 in. wide. When the lamb is shorn and the wool is on the floor the fleece-picker takes the free end of each board in each hand, spreads the boards apart so as to allow them to come on the outside of the wool, then closes the boards towards each other. This quickly gathers the wool between the boards and canvas, and it can then easily be carried away and tossed on the wool table.

Previous to putting lambs' wool on the table the latter should be covered with a piece of hessian or sacking in order to prevent locks going through. When the wool is put on top of this it can be quickly sorted into its different lots. All the best even-quality, clean, well-grown wool should be put into the first or A grade. Any very short, slightly discoloured wool or trimmings from low down on the legs go into the second or B grade. Any wool stained either by excreta or urine should be put into the third line, marking it "Stained pieces." When sorting according to spinning-quality it is necessary to keep each of the following as separate lines: 36's, 40's, 46's, 50's, and 56's. Very little of the two latter counts are shorn as lambs, the majority being from 40's to 46's (mostly Romney or Romney cross). Too many lines should not be made, but Lincoln or Lincoln crossbred must be kept separate from any other better-quality wool. Too often all these wools are found mixed together; this is an unwise proceeding, as the producer does not receive the best price for his best wool, which he would have done had the different qualities been kept separate.

Lambs' wool frequently carries seed, and the procedure detailed under the heading of "Seedy Clips" should be carefully followed in such case.

PRESSING.

The presser should see that his press is in order, and that the caps and woolpacks before being used are put out in the sun, this making the sewing of the bale easier. When putting fleeces into the bale it will be found that three large fleeces will fit in each row, and that two rows are required to fill the square of the press. This is the best method, as in the first place it gives the presser a firmer surface to tramp down, and the wool does not spring up as it does when it is just bundled in. Further, the weight is got in easier, and the wool is well shown in layers of six when the bale is opened for sampling. If the fleeces are very large only five can be put in each layer. In such a case place the first fleece each time in the centre of the bale, then pack the other four round this one. When tramping the fleeces in the press, tramp them hard down each side. This method causes the fleeces to jam together in the centre of the layer and prevents the wool from springing up.

If a farmer has only enough fleeces to make a light-weight bale he should skirt the fleeces and, when classing them, make two lines. Put all the finer-fibre fleeces into one bin and the coarser-fibre fleeces into another bin. When pressing, put the coarse fleeces at the bottom of the bale, then place a piece of bagging on top of them. Next put in the fine-fibre fleeces, and sew the cap on the bale. When branding the bale, make a black line round two sides of the bale at the point where the division comes between the two wools.

SEWING ON THE CAP.

The easiest and best method of sewing the cap to the bale is to start at one of the corners. Drive the needle through the cap first, and then draw the twine through up to the knot. Bring the needle down and drive it through on the right-hand piece of the corner of the bale, then up through the cap again, and down into the bale about the same place. With the twine draw the cap and bale together tight, then drive the needle through from the sewn corner to the loose left-hand piece of the corner of the bale. Put the stitch across this corner and pull tight. This draws the corner together and saves the big open corners which otherwise have to be sewn after the bale is tumbled out of the press.

When sewing the cap and bale together, drive the needle in a slanting upward direction from right to left through the cap, and then drive it into the bale just opposite where it came through the cap. This method makes a short, neat, regular stitch on the outside of the bale, and makes the latter look neater than is the case if the stitches are long and irregular. Further—and this is very important—the short, neat, regular stitch adds to the strength of the pack when the bale is being handled afterwards.

WEIGHING, BRANDING, AND BOOKING.

After pressing comes weighing, branding, and entering the description of the wool in the bale in the wool-book. The bale should be branded on the cap end with the station or farm name and the number; then the same done on one side, also branding on the class of wool in

the bale. Say it is A combing, Romney Marsh hogget: the letters A over RM over H will do; or if it is wethers, W will suffice. If scales are available it is best to have the bale weighed.

The proper stencilling cake or powder should be used for branding. If a cake, knock off about one-quarter and break this into small pieces; put these into a tin receptacle and pour in boiling water, which will dissolve the pieces quickly. When cool pour into a bottle, cork, and use the liquid as required, diluted with cold water if too thick. Into an enamel or tin plate put a small piece of wool; pour some of the liquid on this, and when branding the bale dip the brush into the plate (this ensures an even supply of the fluid) and rub the brush over the stencil-plate. If a station or farm has a private mark put this on the bale first; the name of the station next in the middle; then the number of the bale underneath.

All bales as soon as they are branded and weighed should be duly entered in the wool-book, with the number of bale in left-hand column, description of wool in the bale in the wide column, and the weight in the three columns on the right. When sending the wool to market an invoice copied from the wool-book should be sent to the selling firm.

GROUPING AND BINNING.

A great advantage to wool-growers, particularly the man with only a small number of sheep, are the "grouping" and "binning" systems. The term "grouping" is applied to any number of bales of wool which have been put together as one line for sale by the wool-broker. For example, a farmer may have one or two bales of fine fleece-wool, which he marks "A," or "1st"; the same number of bales of coarser wool, which he marks "B," or "2nd"; one bale of dingy; and one bale each of pieces, belly-wool, stained pieces, and locks. When these bales reach the wool-store they are opened by the broker, who then groups them with other bales of the same quality and giving the same clean yield.

"Binning" is a term applied to any wool which has been sent in by the grower for his broker to either skirt and class or class only. In the latter case the skirting would have been done in the shearing-shed. When this wool arrives at the store the fleeces are taken out, then skirted and classed in the bins according to quality, condition, strength, colour, and yield. If the skirting has been done in the shearing-shed the broker only has to do the classing and rebaling. In this way the wool is properly got up into even lines for sale, and if a grower has only a small number of sheep, consisting of mixed breeds or crosses, these fleeces are weighed out, classed into their respective bins, and then baled from those bins. Although a farmer may have, say, only half a dozen Southdown fleeces in his clip, those fleeces are classed with Southdown wool from other farmers, after which each line is grouped for the sale. It is to the small farmer's advantage to have this done, because the grouped lines of wool are even in quality and condition, and the buyer can make his valuation easily and bids with greater confidence than if all qualities were contained in the same bale.

SHEARERS' TALLY-BOARD.

A tally-board is very handy in the wool-shed at shearing-time, and can be readily made with a piece of dressed white-pine or thick cardboard. The sample hereunder shows a good arrangement.

Date.	Shearers' Names.				Daily Total.	Aggregate.
	B. Butcher.	W. Burt.	R. Burt.	W. Blythe.		
Oct. 9 ..	26	24	20	19		
	32	31	26	25		
	33	32	27	27		
	24	23	21	21		
	24	23	21	21		
	21	19	18	18		
	—160	—152	—133	—131	576	576
,, 10 ..	26	24	20	20		
	33	32	27	26		
	33	33	27	27		
	25	23	21	21		
	25	24	21	22		
	22	20	19	18		
	—164	—156	—135	—134	589	1,165
,, 11 ..	28	26	21	21		
	34	33	29	29		
	34	33	29	29		
	26	24	22	21		
	26	24	22	22		
	23	21	20	19		
	—171	—161	—143	—141	616	1,781
End of shearing	495	469	411	406	..	..

By showing each shearer's daily total in this manner on the right-hand side of his column the figures stand out clear and distinct, and are quite easy to total up after shearing is finished. The board should be deep enough to complete the shearing, and wide enough to carry all the shearers' names.

POISONING OF STOCK BY SHEEP-DIP: A WARNING.

It appears to be necessary to caution the farming community regarding the use of sheep-dip—especially the poisonous kinds—for purposes other than those indicated by the makers. The Department has learnt of several cases of farm animals being poisoned by sheep-dip used in altogether wrong ways. In a recent case several horses died as a result of being washed with a solution of arsenical dip to rid them of lice; the solution seemed to have been far too strong, absorption from the skin took place, and death ensued.

—*Live-stock Division.*

PASTURES AT WAIMAUNGA EXPERIMENTAL FARM.

C. S. DALGLIESH, Fields Instructor, Hokitika.

THE cultivation, liming, and manurial treatment of the fields at Waimaunga Experimental Farm were dealt with in the *Journal* for May, 1923. The establishment and maintenance of good pastures being a matter of vital importance to Westland farmers, a brief summary of the present conditions of the pastures on this farm should prove useful to those concerned. The reader must understand that the dominant grasses on the farm when the Department took possession were brown-top and sweet vernal, with a lesser proportion of Yorkshire fog and creeping-fog. The better grasses would not hold for more than a year or two, and clovers never established themselves. All the farm pastures have been consistently stocked, and their present condition is not in any way due to light stocking with the object of preservation.

FIELD 1.

This field was sown in November, 1921, with a temporary-pasture mixture of 20 lb. Italian rye-grass, 10 lb. perennial rye-grass, 4 lb. cow-grass, and 1 lb. alsike per acre. It has given a consistent growth of good feed during the summer months, but is now becoming thin in patches, and brown-top is in evidence on the poorer parts. It must be remembered that this field received no rotation cropping to put it in good heart for grass, but was merely sown, following the ploughing and working up of the old brown-top and sweet vernal pasture. This practice is not considered the best, but is necessary at times to secure a prompt supply of palatable feed. Thus the field was sown in temporary pasture with the object of later carrying out rotation cropping and putting it into good condition for permanent pasture.

It is safe to say that the payable life of this pasture is at least four years, but with a view to maintaining the fertility of the soil to the standard of the better grasses such as perennial rye-grass—thus avoiding the expense of ploughing, cultivation, manuring, and seed—it has been top-dressed with artificial manures and carbonate of lime according to the following scheme: (Area 1) basic slag, 3 cwt. per acre, cost £1 2s. 6d. per acre; (2) control area, no manure; (3) superphosphate and Nauru phosphate, equal parts, 3 cwt., cost £1 1s. 9d.; (4) carbonate of lime, 1 ton, cost £1 2s. 6d.; (5) carbonate of lime, ½ ton, and superphosphate, 1½ cwt. (to be applied this spring), cost £1 2s. 10d.

FIELD 2.

Field 2 was sown with a temporary-pasture mixture of 30 lb. Italian rye-grass and 3½ lb. cow-grass per acre in September, 1922. If any fault could be found with the commencement of this pasture it would be the too prolific growth of cowgrass, which retarded the Italian rye-grass. The seeding of this field was heavier than was intended; 26 lb. of Italian rye-grass and 3 lb. of cow-grass per acre was the mixture prepared, but the sowing-machine ran very freely, with the result indicated.

This field yields a plentiful supply of feed during the summer months, but little growth in the winter. There are now too many open spaces which allow room for weeds and inferior grasses to establish. The portion not sown with the temporary mixture was sown with a more permanent mixture, including perennial rye-grass and white clover; it is carrying much closer sward, and is always kept more closely grazed by stock.

FIELD 3.

Sown in the autumn of 1922 with a permanent mixture of 18 lb. perennial rye-grass, 3½ lb. Italian rye-grass, 3½ lb. timothy, 3 lb. crested dogstail, 6¾ lb. cocksfoot, 2¾ lb. cow-grass, and 1¾ lb. white clover per acre, this field now has a most excellent and improving sole of pasture. The southern portion of this field was sown late in April (1922), continuous wet weather delaying the sowing, and the take was poor. A surface sowing of this part was made in the following spring —8 lb. perennial rye-grass, 8 lb. cocksfoot, 2 lb. crested dogstail, 2 lb. cow-grass, 1 lb. white clover per acre — and it now carries a pasture equal to the other part, if not better. The whole field carries a better winter-producing pasture than those sown in temporary mixtures.

FIELD 4.

This field was sown in February, 1921, with a temporary-pasture mixture consisting of 15 lb. perennial rye-grass, 15 lb. Italian rye-grass, 3 lb. timothy, 2 lb. alsike, and 2 lb. white clover per acre. In the autumn and winter of 1923 the field did not look very promising, the pasture deteriorating, with much sweet vernal in evidence and clovers not so good as one would expect. It was therefore top-dressed in the early spring (1923) as follows: (Area 1) superphosphate, 2½ cwt. per acre, cost 17s. 6d. per acre; (2) superphosphate and Nauru phosphate, equal parts, 2½ cwt., cost 17s. 2d.; (3) basic superphosphate, 2½ cwt., cost 18s. 9d.; (4) basic slag, 2½ cwt., cost 18s. 9d.; (5) superphosphate and blood-and-bone, equal parts, 2½ cwt., cost £1 4s. 8d.; (6) control area—the best portion of the field.

All these top-dressed areas have shown a considerable improvement, and now equal the control plot, especially in clover content. The field was not stocked as heavily as one would desire from the beginning of January to the middle of April last; consequently there was a good roughage of feed in the month of May, when seventeen head of cattle — two-year-old heifers and dry cows — were put on. The total area of the field is 13½ acres; this has wintered them well, with plenty of rough feed left, the stock freshening up and putting on condition.

GENERAL.

Judging by observations at Waimaunga and on farms throughout this coast, temporary pastures should be limited to areas for the providing of the necessary bulk of feed at the required time. Such pastures give a great supply of excellent feed for the first two years, but then far too many open spaces appear and allow moss, weeds, and inferior grasses to establish. A pasture of the permanent grasses will not yield the same bulk of feed for the first year or so, but will give a more consistent supply all the year, and a closer sward of pasture is formed; therefore moss and inferior grasses do not have the same chance to flourish.

SEASONAL NOTES.

THE FARM.

ROOT CROPS.

SOWINGS of mangolds, soft turnips, and carrots may be commenced any time after the middle of October, according to the locality or the particular field to be used, the warm situations, of course, coming first. In colder and higher localities it is better to leave sowing until the end of the month. Another factor must be borne in mind, however. The grass-grub beetle, which, it has been shown, does the damage often attributed to the "turnip-fly," is on the wing chiefly during November and early December, the date varying according to the district. If possible, therefore, sowing should be made some time before or just after the period at which the beetle is most prevalent. The period of maximum emergence is earlier in the North Island generally than in the South. The damage to the crop is greater just when the plants are in the two-leaf stage. Rape is affected by the beetle in much the same manner as turnips.

Turnips.—The white varieties take on the average about twelve weeks from date of sowing to readiness for feeding. Good varieties are Purple-top Mammoth, Red Paragon, and Hardy or Imperial Green Globe. If an area of these is sown at the same time they may be fed off in the order named. The area in Purple-top Mammoth should be small, that in Red Paragon a fair size, and the main crop Green Globe. On new land soft turnips are best sown on the flat through every second coulter of the drill, at the rate of 10 oz. per acre. If the land is dirty it is best to sow on ridges 24 in. to 26 in. apart, at 1 lb. per acre, so as to be able to give plenty of intercultivation. Basic super is a very suitable manure, or mixtures of half super and half Ephos, Nauru, or bonedust, at the rate of 3 cwt. per acre; proprietary turnip-manures can also be used at the same rate per acre.

Mangolds should be sown in drills 21 in. to 28 in. apart, 24 in. to 26 in. being ideal for horse-work. The Globe varieties may be sown closer in the drills than varieties like Long Red and White Sugar, which grow large tops. It is a great mistake to sow mangolds in narrow drills and have to do all the cultivation by hand, instead of sowing a little wider and doing the cultivation by means of the horse-hoe. Seeding should be at the rate of from 4 lb. to 6 lb. per acre.

It is often an advantage to soak mangold-seed in water, in order to assist germination by softening the hard capsule. The soaking should be done for about twelve to twenty-four hours immediately before sowing. Half the seed may be treated in this way and mixed with the other half before sowing. If weeds are likely to be a nuisance in a mangold crop grown on the flat, it is a good plan, in order that early intercultivation of rows may be carried out, to mix a little seed of a quick-growing plant such as mustard or oats with the mangold-seed. The growth of these plants will serve to mark out the rows and assist greatly in guiding the cultivator.

Mangolds are gross feeders, and the manuring should be generous; not less than 3 cwt. per acre should be applied, but from 4 cwt. to 6 cwt. will be found profitable on most farms. The plant likes a complete manure, and for this reason most of the special mangold-manures on the market are giving satisfactory results. Mixtures of 3 cwt. super, 2 cwt. bonedust, Ephos, or Nauru, and ½ cwt. sulphate of potash will give good results. Salt is also very beneficial; this should be broadcasted at the rate of 3 cwt. per acre before the seed is sown. Spent salt from the hide-shed is very suitable and cheap for this purpose. Instead of the sulphate of potash and salt, kainit at the rate of 3 cwt. per acre may be used to advantage, as this provides both potash and salt. Kainit should also be applied ahead of the sowing.

RAPE, KALE, AND CHOU MOELLIER.

Early sowings of these crops may be made any time after the first week in October, but usually about the end of the month is early enough. Chou moellier may be sown a week or two sooner than rape or Buda kale. In clean land these crops are best sown on the flat through every second coulter of the drill. If the land is dirty they should be sown in drills 24 in. to 30 in. apart, either on the flat or on ridges, the latter for preference, so as to allow of intercultivation to control weeds. If the crop is being grown for feeding green to cows, manures containing nitrogen, such as made-up rape-manures or mixtures of half super and half blood-and-bone, 3 cwt. to 4 cwt. per acre, give the best results. For lamb-fattening pure phosphatic manures like basic super, or mixtures of half super and half either Ephos or Nauru, will be found very satisfactory. Chou moellier requires a fairly strong soil, also rather heavier manuring than either rape or Buda kale.

Feeding-tests in various districts go to show that chou moellier does not taint milk to any extent if judiciously fed. Being a vigorous grower, it is not so easily affected with club-root as rape, but in badly affected land it becomes a victim to it. It is also stronger and tougher than rape, consequently the aphis and diamond-back moth do not attack it so readily. It is useful for lamb-fattening, but the lambs do not take to it so readily or fatten so quickly as on rape, and its best purpose is for cattle-feeding. It is ready for grazing in from fourteen to sixteen weeks after sowing, and may either be grazed or cut and carted out. If not grazed too hard it will give several feedings during the season; where not required for early autumn feeding it may be left standing right into the winter.

Rape and Buda kale should be sown at the rate of 2½ lb. to 3 lb. of seed per acre, but from 1 lb. to 1½ lb. is ample for chou moellier. If sown in drills the plants are best thinned out to about 20 in. in the drills. Alternatively, the plants may be grown in garden plots and then transplanted into permanent situations. This enables the land to have extra working for destroying weeds. In transplanting large areas the work may be done by opening a furrow with the plough, placing the plants in position 2 ft. apart, and covering the roots with the next furrow. The manure may either be broadcasted before the furrows are opened, or scattered along the furrow before the plants are set in position, as when planting potatoes. If the land is dry the plants are best dibbled in, similarly to cabbage-plants.

THE POTATO MAIN CROP.

The main crop of potatoes should be planted towards the end of October or at the beginning of November, choosing one or other of the standard varieties suited to the district. In view of a probable export from the commercial potato-growing districts to Australia next year, special attention should be given to the class of seed sown. Any malformed or diseased tubers should be absolutely discarded. A keen lookout should be kept for scab and eelworm. The latter disease has been noticeable this season; it has a smooth wart-like appearance on the skin of the tuber.

In planting, the better method is to set up ridges with a drill plough (or single-furrow plough with a sack tied across the breast) 28 in. to 30 in. apart, apply manure between the ridges, and plant the tubers, subsequently splitting the drills to cover. A short time after planting, or just before the shoots appear, give a stroke of the light harrows (this can be done quite well by turning the ordinary tine harrows on their backs), harrowing lengthwise of the ridges. The ridges are thus knocked down to some extent, and any weeds which may have germinated meanwhile are killed. A quick method of planting is to put in and cover the seed and manure at every third furrow of an ordinary plough. A suitable manure under average conditions is 3 cwt. super, 1½ cwt. blood-and-bone, and ¼ cwt. to ½ cwt. sulphate of potash per acre. The addition of stable manure, where available, is very profitable, and the artificial mixture can be cut down accordingly.

CEREALS.

The sowing of spring cereals should be completed in South Otago and Southland during October. It is inadvisable to leave this work too late in the month, but if conditions are not suitable for early sowing the quantity of manure should be increased for the later crops.

Any recently fed-off cereals should be harrowed. It is good practice to sow a few pounds of cow-grass to provide feed on the stubbles after harvest; clover assists the growth of cereals.

PASTURE-MANAGEMENT.

Care should be taken during the coming month that pastures are evenly grazed, and, if there is any indication that stock are neglecting portions of a field, every endeavour should be made to have these cleaned up by dry stock, followed by harrowing, so that the growth may be even during the summer. Watering-places should be given any necessary attention before any dry spell occurs.

SUMMER FALLOWING IN CANTERBURY.

Land badly infested with twitch that is intended for summer fallow should be ploughed in October, in order that full advantage may be taken of the drying nor'-westers which are so common in the spring and early summer. Cross-ploughing and grubbing at frequent intervals should be resorted to later. It should be borne in mind that an implement such as the disk harrow, which cuts the twitch-rhizomes into pieces, should not be used, as such pieces grow just as easily as the larger "roots." In spring working of twitch-land it should be the aim to keep the clods large, so that they may dry out on the surface of the land.

The use of cleaning or smother crops is to be recommended only when a bad twitch area has been so far controlled as to lessen the amount and vigour of that portion which seems inevitably to remain. Even then a smother-crop can be successful only on land which is normally capable of growing a fairly heavy crop. Horse-beans, among other more common farm-crops, have been found very good for cleaning purposes when sown in 18 in. to 21 in. rows and intercultivated for as long as is practicable. Seeding is at the rate of about 2½ bushels per acre. The beans make a valuable horse-feed.

—*Fields Division.*

THE ORCHARD.

CULTIVATION.

With the approach of summer, which often brings hot and dry winds, every endeavour should be made to have the orchard in a good state of cultivation. Orchards left uncultivated or in a semi-neglected condition will inevitably feel the effects, and this will be reflected in the yield later in the season. There are many instances in which quite satisfactory results have been obtained where orchards have been sown in clovers. However, this is a practice which needs careful thought and handling, otherwise disastrous results will follow. The soil must be rich and the rainfall well up to the average, and in practice several things are necessary in order that the trees and fruit may not suffer. In the first place, a considerable strip around the trees should be kept cultivated, this work being usually done by hand. The clovers should be cut several times during the year, and the cuttings placed on the cultivated portion. This material will serve as a mulch, and will very soon decay and add much organic matter to the soil. Where this is carried out a liberal dressing of lime will be necessary, otherwise the land may become unduly sour. If the growth is cut and taken away to serve as feed for stock, trouble will be sure to follow.

Where cultivation is carried out it should be done in a fairly systematic manner. It is impossible to eliminate all hand-work, but it can, however, be reduced to a minimum with the implements now in general use. The neglected strips sometimes seen round trees are not conducive to the best results, and would not be permitted in any well-managed orchard. The chief reason for cultivation during the spring and summer is to conserve the moisture in the soil, which in turn will stimulate wood-growth. This is quite a necessary function which every tree should perform at that period, otherwise it is not possible for the tree to thrive in the manner desired. Moreover, trees that fail to make any wood-growth seldom return consistently payable crops. Methods of cultivation vary with different classes of soil. Where soils are light and friable after the ploughing has been completed, a spring-tooth cultivator does excellent work. If the soil is heavy, a disk may be found more suitable during the spring. Almost all later cultivation can be done with tine harrows.

SPRAYING.

This work must not be neglected, and readers are referred to the directions given in the July *Journal*. A careful watch must be kept for green and black aphis, which is often troublesome on stone-fruit during the spring. As soon as the leaves commence to unfold, the insect begins to work, and no time should be lost in combating it. The most effectual spray to use is Black Leaf 40—1 in 800. The spray is much more effectual when about 3 lb. of soap is used with each 100 gallons of water. A cloudy day or towards evening is the best time to make the application. A second spraying about two weeks later will be found of great value.

A word with reference to the working of spray-pumps. Almost all pumps of any size have an air-chamber which may be used to greater advantage than is often the case. Whether this chamber is on a large hand-pump or a power pump it should be used as an aid to the easier maintenance of pressure. When ready to commence spraying, place the suction-hose into the liquid and give several strokes with the pumping-handle, then throw out the suction-hose and continue pumping until the pressure-gauge shows between 40 lb. to 60 lb. pressure. Return the suction-hose into the liquid and continue pumping. If the pump is worked in this manner it is very much easier to maintain an even pressure, and, moreover, there is less strain on the pumping outfit; the method is in every way more satisfactory.

—L. Paynter, Orchard Instructor, Christchurch.

CITRUS-CULTURE.

Fortunately for the growers of citrus-fruit in the Auckland District, very little frosty weather was experienced during the winter now concluded, and therefore very little damage has been caused to citrus-trees generally. However, in cases where laterals or the heads of leaders have been cut back by frost, the affected areas should be immediately removed—cutting back well below any damaged portion into live tissue and to a prominent bud or lateral. As mentioned in previous notes, brown-rot has been very bad in several localities, so bad, indeed, in one or two groves that the wood of the trees has been killed outright on such portions as were supporting fruit at the time that the fruit and foliage became infected. Such wood should receive the same treatment as that which has become frosted, and be destroyed by burning. All diseased fruit and leaves should also be removed, where at all practicable—either buried to a sufficient depth to preclude the possibility of further distribution of spores, or removed to some safe distance from the grove.

Spraying: The spraying programme to be carried out in October includes (1) the application of red-oil emulsion, 1–40, to both lemon and orange trees, during the earlier part of the month, for the control of sucking-insects generally; (2) the application of bordeaux, 4–4–40, as soon as the blossom-petals have dropped from the main spring flowering, to be followed, of course, by later applications should conditions demand.

Manuring: The manuring of citrus-trees should be undertaken immediately, and the following applications are recommended: For bearing trees, 6 lb. to 8 lb. of artificial fertilizers composed of two

parts of blood-and-bone, one-quarter part of sulphate of potash, and three-quarter part of high-grade superphosphate; for young trees, two to five years old, 2 lb. of blood-and-bone at the present time, with a small dressing of nitrate of soda or sulphate of ammonia during the growing season, the latter to be applied as a top-dressing and hoed lightly in round the feeding-roots.

Cultivation: The spring cultivation may now be put in hand. Where lupins have been grown between the trees for the purpose of adding nitrogenous matter and humus to the soil they should be ploughed in as soon as circumstances permit.

Picking: The final picking of Poorman oranges should be made immediately, and put on the market.

FIREBLIGHT.

Persons occupying land upon which hawthorn has recently been growing, in areas situated within the boundaries of the Third Schedule of the Fireblight Act, are reminded that their obligations do not cease with the destruction of all hawthorn growing on the land before 30th June, 1923, but that any plants which may appear subsequently must forthwith be completely destroyed.

—J. W. Collard, Orchard Instructor, Auckland.

POULTRY-KEEPING.

LATE HATCHING.

It may be well to reiterate that if only profitable stock are to be reared, the last of the eggs for the season should now be in the incubators or under broody hens. Chicks brought out, say, in the middle of October are rather on the late side, and are starting their lives under a big handicap as compared with those hatched earlier in the season. The production of late-hatched stock is the weak link on many unsuccessful plants. Some amends, however, may be made with such birds if they are placed under ideal conditions. Not only should they be provided with an absolutely clean piece of ground to run on, but good shade and shelter must not be overlooked. In addition, the food supplied should be of sound quality, and, above all, an abundant supply of succulent green material—that great essential for their welfare—provided for the young birds.

BROODER TROUBLES.

Leg-weakness: If the chickens are going weak in the legs and showing signs of a wobbling walk, it indicates that they are huddling at night and require more warmth. The trouble is often intensified by the lack of sufficient bedding on the brooder-floor, especially when the floor is very smooth. The constant slipping of the chickens on

the smooth surface during the huddling effort brings on a spreading and weakening of their delicate legs. On the first sign of this condition, additional warmth should be applied, and everything done to make the chickens spread out, indicating that they are comfortable. Once chickens have acquired the habit of crowding in corners as a result of being chilled, it is often difficult to break them from it, quite irrespective of any additional heat that may be applied. In such cases, and in order to prevent leg-weakness and other troubles, it is a good plan to first cover the floor of the brooder with a thin layer of chaff, say, ½ in. deep. On this, place a single piece of sacking the full size of the brooder-box, and cover it with chaff to a depth of about 1 in. This will not only provide a comfortable bed for the chicks, but, in addition, will induce them to spread out. It will also prevent them from slipping, with its consequent bad effect on their legs.

Unabsorbed yolk: Much of the mortality which takes place during the early brooder stages is due to the yolk (which is drawn into the chicken's body just before it leaves the shell) failing to digest. In such cases the yolk, instead of being gradually absorbed to provide nourishment for the chick during the first few days, as nature intended, gets into a more or less hardened state, which prevents it from being digested. A chicken thus affected will sometimes live for weeks, but as a general rule it will die even when receiving the best of care and attention. Thus when this condition is disclosed in a *post-mortem* examination the cause of death will be made apparent. It is generally believed that failure of the yolk to digest is due to feeding the chicks too soon after hatching, or to overfeeding during the early brooder stage. It is also often considered that breeding from overfat hens is responsible. While all these factors may have some influence in regard to this undesirable condition, experience goes to show that it is due more to improper incubation than to any other cause. This is confirmed to a great extent by the fact that the trouble is seldom present in chickens that have been hatched by the natural mother. There it will be found that the yolk in its sack is in a more or less liquid state, which enables it to run freely and finally become absorbed. With incubator-hatched chicks the chief cause of the trouble is due to having the temperature too high during the whole or a part of the incubating-period, thus causing half-baking of the yolk and rendering it incapable of absorption. If this trouble is to be prevented the yolk must remain in liquid form and be used up as food for the growing bird. It is always advisable to open up any chicken that dies, in order to discover, if possible, the cause of death. Chickens often die from eating the joint of the grain, stalk in the chaff, and other fibrous material. If a supply of fine sharp gravel grit is always available to the young birds right from the start, it will go a long way towards preventing trouble in this respect.

Sundry: The common mistake should not be made of putting more chicks in the brooder than it is capable of brooding to the best advantage. Overcrowding is simply courting disaster. This practice is bad enough in any branch of the plant, but it is especially disastrous with the young tender stock. Strict attention to cleanliness is another

important matter which must not be overlooked. If the quarters are allowed to become foul, the presence of parasites, lice, mites, &c., is encouraged. Before a new batch of chicks is placed in the brooder, the latter should be well cleaned and disinfected.

FIGHTING VERMIN.

With the approach of hot weather constant warfare should be made against vermin. I cannot advise too strongly the use of tar to cover up crevices and joints, the common harbouring-place of insect pests, especially of that vicious little night marauder, the red mite. Tar thoroughly applied means that every crevice and crack is covered up. Vermin are most active in hot weather, and at such a time the tar is soft and is then most objectionable to insect-life. A good feature of tar is that it is a timber-preservative. An advantage tar presents over whitewash is that, while it is not so attractive a covering for timber, it can be thoroughly effective, whereas whitewash is too often ineffective and a deceptive covering. I have seen fowlhouse interiors which looked beautifully clean to the eye, but with swarms of insects breeding behind the caked whitewash, while the red mites were thick in out-of-way corners which the whitewash-brush could not reach. The red mite usually makes its first appearance under the perches, and to prevent this I would advise giving the latter frequent applications of kerosene or strong disinfectant.

Nests are another source of contamination—in fact, the principal harbour for fleas. These pests mostly hide under the nesting-material, and cause no end of annoyance to the birds when they visit the nests to lay—a common cause of their laying in odd corners of the house. Nests should be constructed in such a way as to be easily removed and effectively cleaned.

The value of a dust bath in assisting poultry to free themselves from vermin is not generally appreciated as it should be. It is common to see fowls badly infected with vermin without an inch of soft ground for them to make a dust bath in. Where fowls are provided with an outside run, the best place for a dust bath is on the sunny side of a shrub. Any dusting-place should be frequently spaded up. Where it is provided in the house it will not always be appreciated by the fowls unless it is frequently freshened up by the addition of new material. It should not be forgotten that feather-pulling is frequently caused by birds being badly infested with vermin—a minute mite which causes severe irritation at the roots of the feathers. A bird affected in this way will invite her mates to pluck out her feathers as a means of freeing herself from the irritation. Cases have certainly occurred where feather-pulling has taken place in flocks practically free from vermin, but in such instances the birds have been very closely confined, and have not been provided with plenty of scratching-material to keep them occupied and in a healthy condition. Once fowls acquire the bad habit of feather-pulling there is no effective cure; prevention is the only safe course, the great essentials being a good outside range under the most natural conditions possible, combined with clean quarters and constant warfare against vermin.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

FEEDING AND WATER.

A CONSTANT watch should be kept on the stores in the hives. Usually at this period there is a steady drain on the food-supply to meet the incessant demand for brood-rearing. If an examination of the hives was carried out, as advised in my July and August notes, then the losses attendant upon spring starvation will have been avoided; but it is not wise to neglect to feed where stores are short, as the spring is the most critical period for the beekeeper. The weather conditions are not always favourable for the bees to work the early spring blossoms, and in populous colonies the food-supply should be augmented —but only where there is a noticeable shortage. If there is a good queen in the hive she will usually begin laying as fast as weather conditions will permit, and it is a mistake to start feeding unless stores are very short, as it stimulates brood-rearing, and, when commenced, must be carried on until a natural flow sets in from the fields.

Abundance of stores is certainly required at this season, and if the beekeeper finds that additional food is required it can be supplied in the form of combs of honey or as a syrup. The feeding of combs of honey should not be practised unless the beekeeper is sure that his apiary is free from disease, as there is always danger of spreading disease by this method. No better substitute for honey has been found than cane-sugar, and it is far safer to use it at all times if the beekeeper is not satisfied as to the health condition of his apiary. Honey from an unknown source should never be fed. There are many feeders on the market. The division-board feeder is the best to use at this season, as it will serve the double purpose of feeder and division-board in cases where the colony is not strong enough to occupy all the frames in the hive.

In the spring months, when brood-rearing is at its height, bees require a good supply of clean water in the apiary. If this is not provided they are apt to become a source of annoyance at drinking-troughs and by congregating round domestic supplies. Brood requires a great deal of water in addition to pollen and honey. The amount depends largely on how much brood-rearing is going on, and to what extent nectar is coming in from the fields. If water is not close at hand many bees are lost in trying to obtain it, more especially as the weather is often changeable and boisterous in the spring.

Many simple contrivances can be made to supply water. "Simplicity" feeders make excellent vessels for the purpose, but they require to be filled frequently. To start the bees taking water from any particular place it is a good plan to slightly sweeten the first water given.

DISEASE.

At all times when examining the combs keep a strict watch for symptoms of disease. Beekeepers should never lose an opportunity of acquainting themselves with foul-brood in all its stages. At this season, if isolated capped cells are discovered in frames which contain no other brood, these should be treated as suspect and subjected to the test for foul-brood. If on opening a cell, when a sharp-pointed piece of stick

is inserted, the dead imago can be lifted out complete in form, the bee-keeper may conclude that if dry it is a case of starvation, and if moist a case of chilled brood. If, however, the contents of the cell adhere to the point of the stick in a ropy ill-smelling mass it may be concluded that the hive is diseased. There is perhaps no surer indication of the presence of foul-brood in the hive than the objectionable smell of the decayed larvæ. Beekeepers who once recognize this odour will have no difficulty in detecting the disease in that stage. The last and most difficult form of foul-brood is the dry stage, and in this form it has baffled beekeepers of long standing. Only a careful examination can reveal its presence. The diseased larva, having dried to a scale, adheres to the lower side of the cell, and can be removed by scraping with a sharp-pointed instrument. If the aforesaid isolated capped cells on being opened appear at the first glance to be empty, they will almost invariably yield a scale if examined, and the hive should be marked for treatment.

Wherever there is a fair yield of nectar from spring flowers the beekeeper would do well to take advantage of the warm days of the month to treat any cases of disease which he may have noted earlier in the spring. However, no hard-and-fast rule can be laid down in this matter, everything depending on locality and weather conditions. In some districts it would be almost fatal to treat the bees in October; in others where right conditions prevail it may be carried out with ease and safety, and the bees brought into good condition by the time a surplus may be expected. Wherever treatment has been undertaken the colonies should be watched in order to see that there is no danger of starvation, and where the spring flow is not considered heavy enough it should be supplemented by liberal feeding.

WHEN TO START AN APIARY.

One of the questions most frequently asked by the would-be beekeeper is, "When should I start beekeeping?" Probably no time is better than when the bees are swarming. If the beginner procures a good prime swarm, leaves it in a clean box for three days, and then hives it in a new hive, on new frames, with full sheets of foundation, he has made the best start it is possible to make in beekeeping. The leaving of the swarm in a box for three days is purely a preliminary measure in case there is any disease in the apiary from which the swarm is procured. By the end of three days the bees will have consumed the honey they brought from their old home, and at the same time have disposed of the foul-brood germs (which are innocuous to the adult bee), and be ready and willing to be transferred to their permanent home to start brood-rearing in earnest.

As the bees will have become used to their box by the end of three days, it is as well to carry out the transfer with care. It should be done at sundown on the third day. The hive should be placed in position, a clean sack spread over the alighting-board and surrounding ground, and the hive-body raised from the bottom-board about an inch or so by means of a stone or piece of wood. The box should be firmly grasped with both hands, inverted over the sack as near the hive as possible, and the bees dumped with a brisk movement on to the alighting-board. One shake will dislodge the greater part of the cluster, and the few remaining bees can easily be shaken out

and the box taken away. Be sure the queen is out of the swarm-box, and the bees will crawl in a steady stream into the entrance, their progress becoming more rapid as soon as the queen has entered the hive. When the queen is safely inside, the hive body should be lowered and the entrance slightly contracted.

It is advisable to place a feeder inside the hive. Even if the weather is good and a fair supply of nectar available, a few pints of good warm syrup fed a day or two after hiving will work magic with the new colony, and enable it to build up in time to yield a surplus when the main flow sets in.

The beginner should always start in the spring, and on no account should he attempt to commence with established colonies unless they are purchased from a breeder who guarantees his bees to be clean. Old hives are too apt to be homes of disease, and are only fit to be handled by the experienced apiarist.

—E. A. Earp, Senior Apiarist.

THE GARDEN.

VEGETABLE-CULTURE.

In October crops of asparagus, rhubarb, and salads should be fed with fertilizers as required to induce strong growth. Beds of rhubarb that have been down for four or five years and have had the early crops pulled from them may be lifted, cut up, and replanted on well-prepared new ground. Thin seedling crops as soon as they are ready. Plant the balance of the potato crop, and sow the main crop of carrots and red beet, also peas, leeks, celery, silver-beet, and dwarf and runner beans. These beans deserve more attention from the gardener; they are easily grown. Whether the season is wet or dry makes little difference to them, while they provide excellent dishes of green beans in summer and dry ones in winter. Sow down a bed of lettuce thinly, with the view of thinning them out and growing the crop in the seed rows. Towards the end of the month sow broccoli and brussels sprouts for planting out towards the end of the year. It is a common mistake to sow these beds too thickly; this should be avoided. Those intending to grow kumaras (sweet potatoes) should select a piece of moist, warm, friable soil, and give it thorough preparation ready for planting out in November.

TOMATOES.

While it is unwise to put out tomato-plants too early, each grower must solve for himself the problem of when to plant out. In some areas of the Dominion that time will arrive during the month of October, and for others rather later. In windless, sheltered districts sticks are used to train the plants on, and are perhaps best, but in more exposed localities a wire trellis is preferred, and in the drier sections plants are sometimes trained to four stems and are allowed to grow without support. Harrow in a dressing of manure before planting, and endeavour to have the plants firm, well rooted, and sturdy. To obtain this, keep them rather on the dry side while hardening them off, and plant them out before they become crowded. Plant firmly in a firm bed.

Under glass, the first and second flower-cluster will be setting, and as these are of the greatest value every attention should be given them. It is usual to keep the house warm now, and with rather a dry atmosphere; specially avoid extremes and sudden fluctuations. During the middle of the day, especially in fine weather, it is worth while going through the house about noon and shaking or tapping the vines with a view to scattering the pollen. Study the plants, note the colour, the set of the leaves, and whether growth be slow or over-luxuriant; learn to understand their wants and give them what is necessary. Be specially quick to note the first sign of trouble, to know if it be serious, and immediately apply a suitable remedy. During the busy spring season the necessary time for this is hard to find, and too often a portion of a crop develops extensive trouble before it is detected.

SMALL-FRUITS.

Cape-gooseberry plants will also soon be ready for putting out; 3 ft. apart and 6 ft. between the rows is good spacing. Egg-plants and capsicums are best set out later.

Take advantage of bright, dry weather to hoe and clean up strawberry-beds, stopping all runners on fruiting plants. Backward plants should be coaxed with a light dressing of nitrate of soda, and plantations affected with leaf-spot should be sprayed with bordeaux, 4–4–40. As soon as the plants commence to blossom give them a good dressing of nitrate of soda and lay a mulch between the rows. This is a big task, but it is very rare that it can be dispensed with satisfactorily.

Small-fruits have suffered seriously in the past from the lack of manuring and spraying. Spray raspberries before flowering, and gooseberries and currants after flowering, with bordeaux, using the above-mentioned formula. It is rare to see a break of these plants that is not in serious need of this attention.

TOBACCO-GROWING.

The seed-beds should now be well forward. Thin the plants out where they appear to be crowded. Success depends on an even lot of sturdy plants being available for setting out. A week or so before setting the plants out remove the hessian cover; commence on a dull day so as not to scald the seedlings. The evening before pulling the plants give them a good watering. Pull the plants carefully, and put them, roots down, in a wooden tray or basket, and stand them in a shady place until required for planting. Needless to say, the land to be planted should be in a clean friable condition, with the manures well harrowed in. The usual custom here is to plant about 3 ft. apart, and the land should be marked out at that distance both ways, and the plants put in on the intersections. A convenient arrangement is for a boy to carry the plants and place them in position, and for a planter to follow and dibble them in. The work is best done on a dull day, or, if that is not convenient, during the afternoon. The plants are best watered in. In districts not subject to hard late frosts the plants may be put out in October with advantage.

—W. C. Hyde, Horticulturist.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

TREATING SHEEP FOR PARASITIC GASTRITIS.

"CAMPUS," Otaki Railway :—

Would you please let me know the usual quantities to use when dosing lambs with turpentine and milk ?

The Live-stock Division :—

The use of turpentine in the treatment of parasitic gastritis has not been satisfactory, but if you are determined to use it the dose, a teaspoonful, should be given in a tablespoonful of sweet oil or half a cupful of warm milk. The animals to be dosed should be fasted for at least twelve hours. The dose should not be repeated for at least three days, as turpentine has a marked effect upon the kidneys, and too frequent or too large dosing might cause permanent injury to the kidney substance. A more satisfactory treatment is the use of a 1-per-cent. copper-sulphate solution in water—about 3 oz. of the solution for yearlings and older sheep, and half as much for lambs three months and over. Porcelain or enamel ware should be used in making the solution ; the copper sulphate will corrode metal. Prevention plays a very important part in the treatment of this disease, which is spread by the eggs of the parasite on the pastures. Lambs and uninfected sheep should be kept away from the infected ones ; the lambs, which are more prone to infection than older animals, should be given the cleanest and driest paddocks. Infected pastures can be rendered practically safe by ploughing, the eggs and young worms being turned in and buried. If sown in forage crops, sheep might be put on them later with comparative safety. Draining should prove of benefit, as lack of moisture is unfavourable to the parasite. During treatment the sheep should get an ample supply of good sustaining food.

LOTUS MAJOR.

"LOTUS MAJOR," Limehills :—

I would be glad to know (1) if Lotus major will grow and thrive on peaty land that has not been limed ; (2) which ground is most suitable for it—peaty, or good heavy land that has been cultivated for, say, fifteen years ; (3) whether for seed, is it advisable to sow pure or with some other grass ; (4) how soon after sowing it would be ready to cut for seed ; (5) if sown in a grass mixture with turnips, would it survive under ordinary conditions ; (6) does it respond to lime like other clovers ?

The Fields Division :—

Presuming that drainage has been carried out, Lotus major will grow and thrive on peaty land which has not been limed. Good heavy damp ground that has been cultivated for fifteen years should grow Lotus major well, provided the fertility of the soil has not been too exhausted. For seed purposes Lotus major can be sown with oats at the rate of 4 lb. per acre, or in a permanent grass mixture at the rate of 2 lb. per acre. Whatever method is adopted for the establishment of the plant, a seed crop will not be obtained the first season. With good growth a crop sufficient to warrant harvesting will be secured in the second season. If sown in a grass mixture with turnips, as you suggest, the Lotus major would survive under ordinary conditions. The plant responds by increased growth to applications of lime. A most important point is to be certain that the seed sown is pure Lotus major and not mixed with Lotus hispidus. Parts of Southland appear to be excellently suited for Lotus major seed-production, some of the yields secured having been higher than those in any other part of New Zealand.

RIDDING LAWN OF MOSS.

G. H. LONEY, Wellington :—

Will you kindly let me know the best way of eradicating moss in lawns? My lawn is very badly infested. I have raked it over and sown brown-top seed, but the moss has appeared again as badly as ever.

The Horticulture Division :—

Grassland growing much moss is usually poor and sour. To counteract such a condition it is advisable to apply a top-dressing in spring or autumn—during the growing season—after first raking off most of the moss. Take one part of powdered lime and two of a good clean loam; mix them and apply a dressing of about a $\frac{1}{4}$ in. in depth. In most localities this could be done any time after the middle of July.

CLEANING OUT A SKIM-MILK PIPE-LINE.

E. A. CLAYTON, Whangarata :—

Will you please let me know the best means of cleaning out a skim-milk pipe-line? The milk is pumped along this line ($\frac{3}{4}$ in. galvanized piping) direct from the separator, and the pipe tends to become blocked. Water is regularly pumped through after each milking, but the deposit seems to form in spite of this. Would washing-soda affect the galvanizing, and so poison the pigs?

The Dairy Division :—

The best way to keep the pipe clean would be to make it detachable from the pump with a union joint, and, if a long length, to divide it up into short lengths so that each can be easily taken down. In cleaning, first run through cold water, next use hot water in which a little washing-soda has been dissolved, and brush out with a spiral brush, then rinse with boiling water. Washing-soda used in this way will not harm the pipe. The soda solution should, of course, not be fed to pigs.

SAVING WHITE-CLOVER SEED.

"WHITE CLOVER," Masterton :—

Will you kindly inform me regarding the saving of white-clover seed? The paddock I contemplate saving is land of a light nature, and the pasture consists mainly of white clover with a fair sprinkling of brown-top, cocksfoot, rye-grass, and trefoil. Can the trefoil-seed be separated from that of the clover, and, if not, does it decrease the value of the clover-seed? When would it be advisable to shut up the paddock, and does it require closely grazing beforehand? What is the ordinary method of harvesting?

The Fields Division :—

You would require to graze your paddock carefully from time to time during the early part of the season up to about December, when the flush of grass is about over, and then shut up for seeding the white clover. The better method is to heavily stock the paddock at short intervals, rather than to continue to graze steadily up to time of closing. The object should be to cope with grass-growth, while at the same time allowing the clover to become invigorated. White clover is sometimes difficult to harvest, as, being at best short and dense in growth, it hangs on the cutter-bar of the mower, so that a sprinkling of grass-heads throughout the crop is really necessary to facilitate mowing, and again in raking. Endeavour to catch the crop when the majority of the seeds are ripe and bright in colour. Avoid leaving it too late, otherwise many of the seeds become dark in colour, which greatly affects the value of the sample. Suckling clover cannot be separated from white clover, hence it is recognized as an impurity in the latter, and the price varies accordingly. After cutting and raking, the crop should be cocked and stacked like hay. If a clover-huller is not available, the material would require to be put through an ordinary threshing-mill and afterwards cleaned by one of the seed firms. Much suckling-clover seed can be avoided by arranging to have the white clover come in rather late, as suckling will then ripen first and drop the majority of its seed before cutting commences.

WEATHER RECORDS: AUGUST, 1924.

Dominion Meteorological Office.

GENERAL SUMMARY.

AUGUST is regarded as the last month of winter in New Zealand, but this year it exhibited more of the character of spring. As in July, however, the rainfall was below the mean for the same month in previous years, and especially so in Canterbury and Otago.

The first seven days were very unsettled, and ended with a cold snap, on account of a disturbance which developed off the east coast. High barometric pressure followed until about the 12th. From then until about the 18th disturbances both from the west and north accounted for changeable and very showery conditions. The barometer then went as high as 30·70 in. in the North, and remained high until nearly the end of the month, with fine sunny days and frosty nights, although during the last week there were evidences of low-pressure systems both north and south of the Dominion. The winter has been an open one in the South, and it is reported that very little snow lies on the hills.

The records of bright sunshine to hand are interesting: Auckland reports 188 hours 30 minutes; Rotorua, 160 hours 45 minutes; Napier, 159 hours 15 minutes; New Plymouth, 170 hours 10 minutes; Wellington, 123 hours 21 minutes; Nelson, 193 hours 35 minutes; Hanmer, 133 hours; Waimate, 171 hours 35 minutes; and Hokitika, 175 hours 52 minutes.

Growth was fair in the North, but backward in the South on account of the dryness and frosty nights.

—D. C. Bates, Director.

RAINFALL FOR AUGUST, 1924, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average August Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·44	15	1·14	5·10
Russell	3·06	14	0·64	6·99
Whangarei	3·40	16	0·95	6·93
Auckland	3·72	14	0·78	4·21
Hamilton	3·20	19	0·72	4·15
Kawhia	2·92	10	0·54	4·60
New Plymouth	2·85	15	0·84	5·38
Inglewood	5·84	16	1·72	8·65
Whangamomona	5·33	21	1·40	5·80
Tairua, Thames	3·42	8	1·70	6·98
Tauranga	3·79	13	1·12	4·17
Maraehako Station, Opotiki ..	7·40	10	2·30	4·75
Gisborne	3·85	18	1·06	4·50
Taupo	4·16	10	1·12	4·23
Napier	4·32	10	1·04	2·96
Maraekakaho Station, Hastings ..	3·25	13	0·93	3·31
Taihape	2·96	15	0·70	2·67
Masterton	4·35	18	1·09	3·26
Patea	3·26	13	0·61	3·57
Wanganui	1·97	7	0·67	2·78
Foxton	2·54	8	0·80	3·04
Wellington	4·34	17	1·20	4·40
South Island.				
Westport	3·91	15	0·92	6·27
Greymouth	5·60	14	0·95	7·87
Hokitika	6·64	15	1·44	9·45

RAINFALL FOR AUGUST, 1924—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average August Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Arthur's Pass	5·93	7	1·85	13·13
Okuru, Westland	11·48	8	2·38	11·46
Collingwood	5·94	11	2·09	6·96
Nelson	2·62	8	1·03	3·05
Spring Creek, Blenheim	1·99	7	0·85	2·86
Tophouse	2·86	8	1·02	4·87
Hanmer Springs	2·13	12	0·42	2·23
Highfield, Waiau	0·97	10	0·37	2·28
Gore Bay	0·46	4	0·25	2·28
Christchurch	1·21	10	0·76	1·75
Timaru	0·74	4	0·68	1·48
Lambrook Station, Fairlie ..	1·14	3	0·88	1·53
Benmore Station, Omarama ..	0·92	6	0·41	1·50
Oamaru	0·76	5	0·56	1·76
Queenstown	0·93	4	0·45	1·80
Clyde	0·21	1	0·21	0·80
Dunedin	0·49	6	0·15	3·15
Gore	0·60	7	0·30	2·26
Invercargill	1·06	14	0·22	3·36

EGGS AND EGG-PULP IN COLD STORAGE.

A RETURN issued by the Government Statistician shows the following stocks of eggs and egg-material in cold storage in the Dominion as at 31st July last—corresponding figures for 31st March being added in parentheses: Eggs in shell, 956 dozen (44,942 dozen); egg-pulp, 325,706 lb. (840,889 lb.); frozen whites, 2,836 lb. (2,618 lb.); frozen yolks, nil (nil).

Blackleg-control.—Inoculation of calves for the prevention of blackleg in the districts affected and defined in the regulations was carried out as usual during the past official year, and 45,440 head were vaccinated in the Taranaki District area. This is a slight decrease on the figures for the previous year. The need for the vaccination of calves is still apparent (states the Director of the Live-stock Division), but it is satisfactory to report that the disease does not show any increase, nor has it extended to other districts. A continuance of the restrictions on the movement of calves out of the quarantine area is necessary in order to safeguard clean districts.

British Market for Peas and Beans.—The following advice was cabled by the High Commissioner, London, on 9th September: *Peas*—Blue: Large arrival of Japanese now obtainable at £19 10s. per ton ex store; Tasmanian spot slow, sales at £19 10s. to £20; "A" grade for shipment quoted about £18 to £18 10s., c.i.f.; no inquiry for New Zealand; Dutch small hand-picked sold up to £22 ex store. Maple new crops: New Zealand spot, 72s. 6d. to 75s. per quarter; only little trade passing; September–October shipment sold at 71s. 6d. to 72s. 6d.; Tasmanian spot offered 80s. to 82s. 6d., and to arrive 77s. 6d., but price too high for buyers' ideas, and business has been done at 72s. 6d., c.i.f. London. *Beans*—English winter making up to 52s., and choice old spring up to 70s. per quarter. Chinese horse, September–October shipments Europe sold £10 10s., and October–November shipments Glasgow £10 15s. per ton.

FORTHCOMING AGRICULTURAL SHOWS.

Marlborough A. and P. Association : Blenheim, 22nd and 23rd October.
Hawke's Bay A. and P. Society : Hastings, 22nd and 23rd October.
Auckland A. and P. Society : Auckland, 24th and 25th October.
Poverty Bay A. and P. Association : Gisborne, 28th and 29th October.
Wairarapa A. and P. Society : Carterton, 29th and 30th October.
Whangarei A. and P. Association : Whangarei, 29th and 30th October.
Manawatu A. and P. Association : Royal Show, Palmerston North, 4th, 5th, and 6th November.
Ashburton A. and P. Association : Ashburton, 6th November.
Canterbury A. and P. Association : Christchurch, 13th and 14th November.
Egmont A. and P. Association : Hawera, 19th and 20th November.
Wallace A. and P. Association : Otautau, 19th November.
Waikato A. and P. Association : Hamilton, 19th and 20th November.
Stratford A. and P. Association : Stratford, 26th and 27th November.
Hauraki A. and P. Association : Paeroa, 26th and 27th November.
Southland A. and P. Association : Invercargill, 9th and 10th December
Woodville A. and P. Association : Woodville, 20th and 21st January.
Waimarino A, .P., H., and I. Association : Raetihi, 22nd January.
Pahiatua A. and P. Association : Pahiatua, 30th January.
Clevedon A. and P. Association : Clevedon, 7th February.
Te Puke A. and P. Association : Te Puke, 12th February.
Dannevirke A. and P. Association : Dannevirke, 11th and 12th February.
Northern Wairoa A. and P. Association : Mititai, 17th and 18th February.
Masterton A. and P. Association : Solway, 17th and 18th February.
West Coast A. and P. Association : Greymouth, 18th and 19th February.
Waiapu P. and I. Association : Ruatorea, 25th and 26th February.
Tauranga A. and P. Association : Tauranga, 26th February.
Franklin A. and P. Association : Pukekohe, 27th and 28th February
Mangonui A. and P. Association : Mangonui, 6th and 7th March.
Mayfield A. and P. Association : Mayfield, 21st March.
Temuka and Geraldine A. and P. Association : Winchester, 2nd April.

Agricultural and Pastoral Association Secretaries are invited to supply dates and location of their shows for publication in the Journal.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 24th July to 4th September, 1924, include the following of agricultural interest :—

No. 50590 : Cheese-press ; J. B. MacEwan and Co. (Limited), Wellington. No. 51625 : Fruit-sizing machine ; J. H. Barr, Blenheim. No. 51906 : Fertilizer ; A. H. Renard, Melbourne. No. 52035 : Milk-sterilizing apparatus ; J. Neilsen, Denmark. No. 52136 : Milk-weighing machine ; C. M. Stanley and J. H. Stewart, Apiti. No. 50506 : Milking-machine releaser ; D. McL. Wallace (Limited), Te Aroha. No. 50613 : Milk-cooler distributor ; W. Harvey, Auckland. No. 50634 : Milking-machine teat-cup holder ; W. M. Moore, Palmerston North. No. 50664 : Egg-preserving process ; G. P. Lewis, London, and Guaranizer Limited, London. No. 51752 : Wool-cramp ; J. Main, Timaru. No. 50107 : Cheese-press ; S. H. Jones, Kaupokonui. No. 50751 : Protective veil (beekeeper's) ; S. E. Gardner, East Oxford. No. 50788 : Egg-crate ; A. Turner, Auckland. No. 52318 : Concrete fencing-post ; E. Anderson, Midhirst. No. 52322 : Fencing-tool ; A. F. Johns, Rangiora. No. 50761 : Fruit-grading machine ; G. R. Dixon and F. Offen, Hastings. No. 51966 : Butterfat-extracting from buttermilk ; Milk Industries (Limited), Lismore, N.S.W. No. 52222 : Animal-trap ; H. C. Lane, Wednesfield, England. No. 52435 : Pig-feeding apparatus ; H. Morriss, Nutley, England.

Copy of full specifications and drawings in respect of any of the above may be obtained from the Registrar of Patents, Wellington ; price 1s.